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Abstracts

CANADIAN ASSOCIATION OF GENERAL SURGEONS

01

Operative classification of ventral abdominal hernias: new and practical classification. ***Yasser Selim.*** **From the Ministry of Health.**

Background: Ventral hernias of the abdomen are defined as a noninguinal, nonhiatal defect in the fascia of the abdominal wall. Unfortunately, there is not currently a universal classification system for ventral hernias. One of the more accepted classification systems is that of the European Hernia Society (EHS). Its limitation is that it does not include individual patient risk factors and wound classification. The aim of this work was to find out the basic principles of hernia etiology and pathogenesis, clarify the factors that are important in treatment of ventral hernias, and categorize hernia patients according to those factors. **Methods:** This retrospective study included 238 patients who presented to our surgery department between 2010 and 2020. A full description of ventral hernias was made, including their type according to the EHS. In addition, abdominal wall components were assessed, including strength of rectus muscles, lateral abdominal muscles, and abdominal fascia, namely the linea alba. Patients with spontaneous hernias were grouped according to the size of the defect and the condition of the rectus abdominis muscles, the fascia and other abdominal muscles. **Results:** Patients were put into 6 clinical categories: type 1A, type 1B, type 2, type 3, type 4, and type 5. The grouping of patients was done according to the factors we believed affect the choice of surgical procedure and the prognosis of repair. Patients with types 1 and 2 have normal abdominal muscles, whereas those with types 3 and 4 have weak muscles and weak stretched fascia (linea alba). Type 5 includes incisional hernias. **Conclusion:** The primary purpose of any classification should be to improve the possibility of comparing different studies and their results. By describing hernias in a standardized way, different patient populations can be compared. Numerous classifications for groin and ventral hernias have been proposed over the past 5–6 decades. For primary abdominal wall hernias, there was agreement with EHS classification on the use of localization and size as classification variables.

02

Watchful waiting for large primary splenic cysts. ***Élise Di Lena, Nadia Safa, Sid Rahman, Pepa Kaneva, Liane Feldman.*** **From McGill University.**

Background: Nonparasitic primary splenic cysts (NPSCs) are rare. Symptomatic cysts are treated surgically; small asymptomatic cysts are observed. The management of large (≥ 5 cm) asymptomatic cysts remains controversial. We aimed to describe the natural history and outcomes of operative and nonoperative management for large NPSCs. **Methods:** Patients with splenic cysts diagnosed between January 2004 and December 2019 were identified at an academic health care network. Patients with an NPSC ≥ 5 cm with at least 1 follow-up visit were included. We excluded pediatric patients, those with nonprimary splenic lesions, and those with NPSC < 5 cm. All radiographic images were reviewed to track progression. Data are presented as medians with interquartile ranges (IQRs). **Results:** We identified 512 unique medical records. After 12 exclusions (5 noncystic mass, 2 pediatric, 2 nonsplenic cysts, 3 no follow-up), there were 500 patients with splenic cysts remaining. Of these, 68 had no reported size, 410 had cysts < 5 cm, and 1 had elective laparoscopic splenectomy elsewhere, leaving 21 included patients. Eight patients were symptomatic at initial presentation and underwent surgery. Of these, 2 presented acutely to the emergency department: 1 with hemoperitoneum required admission for transfusions and elective laparoscopic splenectomy, and 1 presented with crescendo abdominal pain and underwent laparoscopic cyst unroofing. The remaining 6 symptomatic patients had elective surgery for pain (4 cyst unroofing, 1 splenectomy, 1 partial splenectomy). The other 13 patients were asymptomatic (10 female, age 49.2 yr [IQR 38.1 to 63.7]). Two underwent surgery owing to personal preference (cyst unroofing and partial splenectomy). Of the 11 who were followed, initial cyst size was 9.1 cm (IQR 5.85 to 11.4 cm). After follow-up of 33 months (IQR 23.5 to 78.5), there was no change in median cyst size (0 cm [IQR –1 to 0]), and no patient underwent elective or emergency intervention for the NPSC. **Conclusion:** In this case series, asymptomatic patients managed nonoperatively for large NPSCs did not become symptomatic or require emergency intervention for spontaneous rupture during the study period. This supports a watchful waiting approach for asymptomatic large NPSCs.

03

Transversus abdominis plane (TAP) blocks with and without dexamethasone in colorectal surgery. ***Nawaf Abu-Omar, Zarrukh Baig, Nathan Ginther, Dilip Gill.*** **From the University of Saskatchewan.**

Background: The transversus abdominis plane (TAP) block is a peripheral nerve block that has been shown to significantly reduce postoperative opioid requirements. The use of dexamethasone in conjunction with peripheral nerve blocks has been proven to be an effective adjunct; however, its use remains off-label. The objective of this study was to assess pain control in the first 48 postoperative hours after minimally invasive colorectal surgery in patients who received laparoscopically placed TAP blocks with and without the administration of perineural dexamethasone. **Methods:** Sixty patients undergoing laparoscopic colorectal surgery were included in this retrospective cohort study. Patients were allocated into 2 groups. Four patients were excluded owing to chronic opioid use and conversion to open surgery. Group 1 (TAP) received bilateral TAP blocks using 0.25% bupivacaine (1 mL/kg) with epinephrine. Group 2 (TAP-D) received bilateral TAP blocks using 0.25% bupivacaine (1 mL/kg) with epinephrine in combination with dexamethasone (4–8 mg). Patient demographics; wound class; opioid use in the post-anesthetic care unit (PACU), at 24h and 48h; use of patient-controlled analgesia (PCA); and length of stay were recorded. The study included 30 patients in the TAP block group and 26 patients in the TAP-D group. **Results:** There were no significant differences between the characteristics of both groups, including surgical indication and technique. There was a

significant difference in PCA use between the 2 groups, with the TAP-D group having a 38% greater PCA use. Overall, TAP blocks with perineural dexamethasone did not significantly change opioid requirements in the PACU, at 24h or 48h postoperatively. **Conclusion:** A multivariate analysis adjusting for 10 confounders showed a trend toward lower opioid use in the first 48h with TAP-D (–9.4 mg); however, it was not significantly different ($p = 0.242$). A larger sample size with standardized PCA use can signify the benefit of adding perineural dexamethasone to conventional TAP blocks in the setting of minimally invasive colorectal surgery.

04

What factors determine publication of resident research day projects? ***Zarrukh Baig, Zaini Sarwar, Carlos Verdiales, Mike Moser*****. From the University of Saskatchewan.**

Background: Research is an integral part of surgical training and a mandated competency by national accreditation bodies. Most residents engage in research, but the conversion of this research into peer-reviewed publications is unknown. The objectives of this study were to assess the conversion rate of resident research into published manuscripts and determine what factors predict publication. **Methods:** Through a retrospective design, 99 resident research backgrounds were identified from the Surgery Research Day at a Canadian tertiary care hospital between 2008 and 2018. Publication status was determined using Google Scholar and PubMed. Variables associated with resident-specific, mentor-specific, and project-specific factors were assessed for their role in predicting publication. **Results:** Univariate analysis was performed using Student t test or χ^2 test, followed by multivariate logistic regression analysis. Fifty-two (53%) of the 99 backgrounds were published in a peer-reviewed journal, and 43 (43%) were presented at a national conference. Multivariate analysis revealed multidisciplinary research (odds ratio [OR] 4.46, 95% confidence interval [CI] 1.8–11.4, $p = 0.002$), > 1 trainee working on the project (OR 2.56, 95% CI 1.02–6.43, $p = 0.045$), and faculty supervisor having > 25 publications (OR 2.46, 95% CI 1.03–5.88, $p = 0.042$) as significant predictors of publication. **Conclusion:** Our study identified 3 factors that can serve as starting points to increase research productivity among medical trainees.

05

Characterization of near-infrared imaging and indocyanine green use amongst general surgeons. ***Kevin Verhoeff, Valentin Mocanu, Breanna Fang, Jerry Dang, Warren Sun, Noah Switzer, Daniel Birch, Shahzeer Karmali*****. From the University of Alberta.**

Background: Interest regarding the utility of intraoperative indocyanine green (ICG) near-infrared fluorescence imaging (NFI) continues to grow. This study aims to assess frequency and perceived barriers to NFI use among general surgeons. **Methods:** This was an online survey sent to members of the Canadian Association of General Surgeons and the Society of American Gastrointestinal and Endoscopic Surgeons. Survey development occurred through consensus of 3 NFI-experienced surgeons. **Results:** The survey was distributed to 3933 surgeons, of whom 1641 (41.7%) opened the email. Survey completion rate for those that opened the email was 16.0% ($n = 263$). Most respondents had used intraoperative ICG ($n = 161$, 61.2%), with routine ($n = 61$, 37.9%), or selective ($n = 70$, 43.5%) use being common. Training; higher case volumes; and bariatric, thoracic, or foregut subspecialty were associated with ICG use ($p < 0.001$). The most common reasons for ICG use were anastomotic assessment ($n = 117$, 72.7%), cholangiography ($n = 106$, 65.8%), macroscopic angiography ($n = 66$, 41.0%), and assessment of bowel viability during ischemic presentations ($n = 101$, 62.7%). Inadequate training and evidence were common perceived barriers. Lack of awareness was cited for nonuse during less common techniques. For nonadopters without ICG access ($n = 68$), more than half stated they would use ICG for laparoscopic cholecystectomy (35, 51.5%), anastomotic perfusion (43, 62.3%), ureteric identification (39, 56.5%), and during ischemic presentations (52, 75.4%) if they had access. **Conclusion:** ICG use is common among general surgeons. High case volume as well as bariatric, foregut, and thoracic surgery subspecialty practices are associated with increased ICG adoption. The most common perceived barriers to ICG use appear to be lack of evidence, lack of awareness, and lack of training. High-quality studies are required to evaluate NFI for procedures with frequent use; if benefits are supported, training will be imperative to improve ICG adoption.

06

Variation in opioid prescribing after outpatient breast surgery: Time for a streamlined approach? ***Julie La, Anood Alqaydi, Xuejiao Wei, Genevieve Digby, Susan Brogly, Shaila Merchant*****. From Queen's University (La, Alqaydi, Digby, Brogly, Merchant) and ICES Queen's (Wei).**

Background: Opioids are frequently prescribed for pain management after surgery but can lead to misuse, diversion, and inappropriate disposal. We describe opioid prescribing and predictors of higher-dose prescriptions in patients undergoing outpatient breast surgery in Ontario, Canada. Patients aged ≥ 18 years undergoing outpatient breast surgery without reconstruction between 2012 and 2020 were identified using linked administrative health data. Procedure types were categorized as follows: P±axilla, T±axilla and R±axilla (P = partial excision, T = total excision, R = radical excision, axilla = axillary intervention). **Methods:** Primary outcome was filling an opioid prescription within 7 days of surgery. Secondary outcomes were total oral morphine equivalents (OME) filled (milligrams) and filling > 1 prescription within 7 days of surgery. Associations (risk ratios [RR] and 95% confidence intervals [CI]) between patient and clinical variables and outcomes were estimated in multivariate models. **Results:** During the study period, 84369 patients underwent outpatient breast surgery. Patients were mostly female (98%), healthy (Charlson comorbidity index [CCI] 0–1, 91%), and resided in an urban location (89%). More than half (56%) underwent surgery for malignant disease, mostly P±axilla (90%). Of the cohort, 72% ($n = 60\,620$) filled an opioid prescription. Mean OMEs prescribed increased with invasiveness of the procedure (P±axilla = 163 ± 400 mg; T±axilla = 180 ± 307 mg; R±axilla = 208 ± 255 mg, $p < 0.0001$). For all procedures, opioid prescribing decreased over the study period from 185 ± 344 mg in 2012 to 106 ± 384 mg in 2020. Factors associated with filling > 1 opioid prescription were

bilateral v. unilateral surgery (RR 1.64, 95% CI 1.42–1.89), CCI 2+ v. 0–1 (RR 1.68, 95% CI 1.49–1.90), male sex (RR 1.43, 95% CI 1.11–1.85), malignant disease (RR 1.21, 95% CI 1.10–1.33) and increased invasiveness (RR 2.07, 95% CI 1.79–2.40 for R±axilla v. P±axilla). **Conclusion:** Most patients undergoing outpatient breast surgery fill an opioid prescription within 7 days. Dosing varied by surgical procedure and patient factors. Streamlined opioid prescribing for outpatient breast surgery may be warranted in some patients.

07

Trends in graduate degree types and research output for Canadian academic general surgeons. ***Kieran Purich, Kevin Verhoeff, Alexander Miles, Janice Y. Kung, A.M. James Shapiro, David L. Bigam.*** **From the University of Alberta.**

Background: The proportion of Canadian general surgeons with graduate degrees is increasing. It remains unclear what graduate degree subtypes surgeons hold and whether differences in academic output exist between subtypes. This was an observational study evaluating the degrees held by general surgeons at the largest hospitals associated with Canadian English-speaking residency programs. **Methods:** Data on graduate degree subtype (none, PhD, MSc [basic science], clinical epidemiology [ClinEpi], MPH, MEd, other masters degree) and publication output from 2013 to 2018 were collected. Primary outcome was graduate degree status and degree subtype. Secondary outcomes were publication volume and impact across different graduate degree subtypes. Kruskal–Wallis testing and Dunn's multiple comparison test were used to assess statistical significance. **Results:** We identified 299 surgeons, of whom 136 (45.5%) had masters degreres, and 46 (15.4%) had a PhD. Since 1990, the proportion of Canadian academic surgeons who hold graduate degrees has increased dramatically, with a greater proportion of surgeons completing degree programs post-residency. In recent years, fewer surgeons are pursuing a PhD or MSc (basic science), and a growing proportion of surgeons are pursuing ClinEpi, MPH and MEd degrees. In our sample, surgeons with a graduate degree published a similar volume and impact of research, regardless of their graduate degree subtype. Surgeons with a PhD published more basic science research than those with ClinEpi, MEd, or MPH degrees (1.5 v. 0, respectively, $p < 0.05$), while surgeons with ClinEpi degrees published more articles as first authors than surgeons with an MSc (2.0 v. 0, $p = 0.003$). **Conclusion:** An increasing number of Canadian academic general surgeons are pursuing graduate degrees, with a growing trend toward the completion of ClinEpi, MPH and MEd degrees. In our sample, research productivity and impact was similar across all degree subtypes. Institutional support allowing surgeons to enroll in diverse graduate degree types will enable a greater breadth of research while maintaining research productivity.

08

Would you prefer to undergo breast-conserving therapy or a mastectomy for early breast cancer? Comparison of perceptions of general and plastic surgeons. ***Samantha Albacete, Ashlee Matkin, Danielle Dumestre, Lashan Peiris.*** **From the University of Alberta.**

Background: The standard of care for patients diagnosed with early breast cancer is either a mastectomy, with or without breast reconstruction, or breast-conserving therapy (BCT), involving lumpectomy and adjuvant whole breast radiation therapy. The objective of this study was to explore differences in the personal preferences of general v. plastic surgeons in the treatment of early breast cancer. **Methods:** A survey was sent to 112 general surgeons and 424 plastic surgeons using SurveyMonkey. There were 35 questions in 3 sections: demographics, practice patterns, and case scenarios exploring personal preferences for treatment. All analyses were performed using the Social Science Statistics website calculators, with a level of significance of $p < 0.05$. **Results:** Survey completion rate was 26% (57 general surgeons and 81 plastic surgeons). In the setting of T1 cancers with a small tumour:breast volume ratio ($p < 0.00001$), T1 node-positive cancers ($p < 0.0015$) and bilateral small node-negative cancers ($p < 0.00001$), general surgeons were more likely to opt for BCT than plastic surgeons, who were more likely to choose a mastectomy with immediate breast reconstruction (IBR). For T2 cancers with a larger tumour:breast volume ratio, plastic surgeons were more likely to choose mastectomy with IBR, and general surgeons were more likely to choose mastectomy with no reconstruction ($p < 0.05$). In T3 node-negative cancers, general surgeons preferred oncoplastic options, while plastic surgeons chose mastectomy with IBR ($p < 0.00001$). For cancers with *BRCA* mutations there were no differences between surgeons. When considering contralateral mastectomy, in a unilateral cancer and negative genetics, plastic surgeons were more likely to consider contralateral mastectomy ($p < 0.00001$). **Conclusion:** This study confirms the differing perceptions of general and plastic surgeons in the surgical treatment of early breast cancer, suggesting personal preference may influence how each specialty counsels patients. This emphasizes the importance of multidisciplinary discussion in breast cancer treatment and brings awareness to the inherent biases each specialty holds.

09

Lack of representation of women and BIPOC individuals in Canadian academic surgery. ***Rahim Valji, Simon Turner.*** **From the University of Alberta.**

Background: To ensure equitable representation of women and BIPOC (Black, Indigenous, person of colour) individuals in surgery, it is first necessary to understand the presence and extent of disparities that exist. The objective of this study was to determine whether there is a deficit of women and BIPOC individuals in Canadian surgery and in surgical leadership positions. **Methods:** The websites of the 17 Canadian medical schools were examined, and faculty members of each department of surgery were categorized as either male or female, and white or BIPOC. To determine the sex and race of the surgeon in question, their full name was inspected, and a search was performed for online photographs and/or an online profile of some kind. **Results:** This study took place in July and August 2021. We identified 4891 academic surgeons; 2734 were male and white (56%), 1145 were male and BIPOC (23%), 739 were female and white (15%), and 273 were female and BIPOC (6%). We identified 161 division heads; 111 were

male and white (69%), 33 were male and BIPOC (20%), 15 were female and white (9%), and 2 were female and BIPOC (1%). Eighteen department chairs were identified: 13 were male and white (72%), 3 were male and BIPOC (17%), 2 were female and white (11%), and none were female and BIPOC (0%). Sex and race breakdown was further categorized by school and specialty. **Conclusion:** The relative percentage of female academic surgeons is very low compared with Canadian demographic data. The relative percentage of BIPOC academic surgeons is closely in keeping with Canadian demographics. The findings of this study suggest that actions must be taken to improve diversity and inclusion in surgery.

10

Medical student interest and perspectives on pursuing surgical careers: a multicentre survey evaluating 5-year trends. ***Kieran Purich*, *Kevin Verhoeff*, *Brett Mador*, *Steffane McLennan*. From the University of Alberta.**

Background: Medical student interest in surgical specialties has declined over the last 25 years. The objective of this study is to characterize attitudes of Canadian medical students toward pursuing surgical specialty training, barriers to pursuing surgical careers, and how those perspectives have changed over a 5-year period. **Methods:** An anonymous survey was distributed through REDCap to medical students at the University of Alberta and University of Calgary. Survey questions were developed to characterize student interest in surgical specialties, barriers to pursuing surgery, and the impact of surgical education opportunities on surgical interest. This survey was developed in accordance with the AAPOR Reporting Guidelines for Survey Studies. **Results:** Survey engagement was 26.7% (n = 176) in 2015 and 24.2% (n = 282) in 2021. General surgery had the highest rate of student interest in both survey years (2015: 67, 38.3%; 2021: 94, 39.2%). The most frequently reported barrier to pursuing a surgical career was worry about the stress that surgical careers can put on personal relationships (2015: 70.9%; 2021: 73.8%, p = 0.50). Female respondents were significantly more likely to cite issues including gender discrimination as possible deterrents to pursuing careers in surgery (female: 52.0%; male: 5.8%, p < 0.001). **Conclusion:** Despite substantial interest in surgery, many students find that work–life balance in surgical specialties is the primary barrier to pursuing a surgical residency. Further, perceptions of gender bias in surgery among female medical students highlights the need for continued efforts to promote gender equality within surgical disciplines.

11

Difficult cholecystectomy with cholecystogastric fistula. ***Ali Safar*, *Atif Jastaniah*. From McGill University.**

Background: We present a case of cholecystogastric fistula that was found unexpectedly during elective laparoscopic cholecystectomy in a 61-year-old female. The patient presented with a clinical picture of chronic cholecystitis. Her abdomen was mildly tender in the right upper quadrant. She had a normal white blood cell count with normal total bilirubin. **Methods:** Ultrasound showed cholelithiasis with gallbladder distension. She underwent laparoscopic cholecystectomy with repair of the cholecystogastric fistula and application of an omental patch. Postoperative course was uneventful, but there was a delay in discharging the patient owing to social factors. **Results:** Pathology was negative for malignancy in the gallbladder, and gastric biopsy showed *Helicobacter pylori* with no evidence of malignancy. **Conclusion:** Laparoscopic cholecystectomy is one of the most common general surgery operations, and cholecystogastric fistula is a rare complication of gallstones that may be encountered intraoperatively. Preoperative diagnosis remains difficult for the unspecific symptoms. Laparoscopic management is possible when expertise and resources are available.

12

Surviving nonsurvivable injuries: patients who elude the "lethal" Abbreviated Injury Scale (AIS) score of six. ***Morgan Schellenberg*, *Natthida Owattanapanich*, *Areg Grigorian*, *Lydia Lam*, *Jeffry Nahmias*, *Kenji Inaba*. From the LAC + USC Medical Center (Schellenberg, Owattanapanich, Grigorian, Lam, Inaba) and University of California Irvine (Nahmias).**

Background: The Abbreviated Injury Scale (AIS) score is used widely to quantify injury severity by body region. The maximal AIS score is 6, defining a nonsurvivable injury. This study was undertaken to define mortality after AIS-6 injuries in order to determine whether they are uniformly lethal and, if not, whether differences between survivors and nonsurvivors exist that may aid in prognostication or refinement of the current AIS system. **Methods:** All patients in the National Trauma Data Bank (2007–2017) with ≥ 1 AIS-6 injury were included. Exclusions were age < 16 yr and missing data. In-hospital mortality defined study groups; i.e., survivors v. nonsurvivors. Univariable analysis compared clinical/injury data and outcomes. Multivariable analysis examined independent factors associated with mortality. **Results:** There were 21 347 patients who met the study criteria. Of these, 25% (n = 4888) survived to hospital discharge and 75% (n = 14 362) died. The most common discharge destination among survivors was home (n = 2189, 45%). Nonsurvivors had significantly worse Glasgow Coma Scale (GCS) scores in the field (3 v. 14, p < 0.001) and emergency department (ED) (3 v. 15, p < 0.001). Median AIS score was higher among nonsurvivors in the head (5 v. 3, p < 0.001), abdomen (3 v. 2, p < 0.001), and external regions (1 v. 1, p < 0.001). Median time to death was 0.65h, with maximum time to death 8.76h. Multivariable analysis revealed external AIS-6 injuries were associated with the greatest odds of dying (odds ratio [OR] 34.002, p < 0.001) followed by head AIS-6 (OR 10.501, p < 0.001). **Conclusion:** AIS-6 injuries are not uniformly fatal, with 25% of such patients surviving to hospital discharge. Therefore, AIS-6 injuries may not be as catastrophic as previously considered. External and head AIS-6 (i.e., extensive burns and severe traumatic brain injuries) were associated with greatest mortality. When death occurs after AIS-6 injury, it occurs rapidly, with all deaths in this series occurring < 9 h after arrival. We suggest that the AIS-6 verbiage be revised to remove "nonsurvivable."

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Gunshot wounds sustained during legal intervention v. those inflicted by civilians: a comparative analysis. ***Morgan Schellenberg, Panagiotis Liasidis, Kenji Inaba, Demetrios Demetriades.*** **From LAC + USC Medical Center.**

Background: Existing data show that injuries sustained during legal intervention (LI) differ from those incurred during civilian interpersonal violence (CIV), but gunshot wounds (GSWs) have not yet been specifically examined. The study objective was to perform a comparative analysis of patients shot during LI v. CIV. **Methods:** Patients injured by GSW and captured by the National Trauma Data Bank (2007–2017) were included. Exclusions were transfers and self-inflicted, accidental, or undetermined intent GSWs. Injury circumstances defined study groups: GSWs sustained during LI v. CIV. Bivariable analysis compared demographics, clinical/injury data, and outcomes. **Results:** In total, 248 726 patients met the study criteria: 98% (n = 243 150) CIV v. 2% (n = 5576) LI. Race varied significantly between study groups ($p < 0.001$). White patients were the most commonly injured race after LI (n = 2176, 39%). Black patients were the most commonly injured race after CIV (n = 139 067, 57%). Psychiatric disease (9% v. 2%, $p < 0.001$) was more common among LI GSWs. LI patients were more frequently tachycardic (18% v. 13%, $p < 0.001$), hypotensive (26% v. 14%, $p < 0.001$), and comatose (34% v. 15%, $p < 0.001$). LI patients had higher Injury Severity Scores (13 v. 9, $p < 0.001$), required emergent surgical intervention (39% v. 28%, $p < 0.001$) and intensive care unit admission (47% v. 32%, $p < 0.001$) more often, and had longer hospital stay (4 v. 3 days, $p < 0.001$). Mortality was higher after LI (27% v. 14%, $p < 0.001$). Black patients were overrepresented in both groups when compared with their proportion in the US population. **Conclusion:** LI patients were more significantly injured, as quantified by clinical, injury, and outcome variables including increased mortality. Further study of patients shot during LI is needed to better understand this increased burden of injury.

14

The impact of delayed time to first head CT on functional outcomes after blunt head trauma with moderately depressed GCS. ***Morgan Schellenberg, Elizabeth R. Benjamin, Shaun Cowan, Natthida Owattanapanich, Monica D. Wong, Kenji Inaba, Demetrios Demetriades.*** **From LAC + USC Medical Center.**

Background: Recent work suggests patients with moderately depressed Glasgow Coma Scale (GCS) score in the emergency department (ED) who do not undergo immediate head CT have delayed neurosurgical intervention and longer ED stay. The current study objective was determination of the impact of time to first head CT on functional neurologic outcomes in this patient population. **Methods:** Blunt trauma patients presenting to our Level 1 trauma centre (November 2015–October 2019) with a GCS score of 9–12 in the ED were retrospectively identified and included. Transfers and patients with extracranial Abbreviated Injury Scale (AIS) score ≥ 3 were excluded. Patients were stratified into immediate (≤ 1h) v. delayed (1–6h) head CT groups based on time from ED arrival to first head CT. **Results:** Outcomes included functional outcomes at hospital discharge based on the Modified Rankin Scale (mRS). We included 564 patients: 414 (73%) with immediate head CT and 150 (27%) with delayed head CT. Both groups arrived with a median GCS score of 11 and alcohol/drug intoxication did not differ ($p > 0.05$). Abbreviated Injury Scale head/neck score was comparable (3 [3–4] v. 3 [3–3], p = 0.349). Time to ED disposition decision and ED exit were significantly shorter after immediate head CT (2.8h [1.5–5.3] v. 5.2h [3.6–7.5], $p < 0.001$ and 5.5h [3.3–8.9] v. 8.1h [5.2–11.7], $p < 0.001$). Functional outcomes were slightly worse after immediate head CT (mRS 2 [1–4] v. 2 [1–3], p = 0.002). Subgroup analysis of patients requiring neurosurgical intervention showed a greater proportion of moderately disabled patients with a lower proportion of severely disabled/dead patients after immediate head CT compared with delayed head CT (51% v. 20%, p = 0.063 and 35% v. 60%, p = 0.122). Immediate head CT shortened time to disposition decision from the ED and ED exit. **Conclusion:** Patients requiring neurosurgical intervention after immediate head CT had improved functional outcomes when compared with those undergoing delayed head CT. These differences did not reach statistical significance in this single-centre study and, therefore, a large, multicentre study is the next step in showing the potential functional outcomes benefit of immediate head CT after blunt head trauma.

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Contemporary utility of diagnostic peritoneal aspiration in trauma. ***Morgan Schellenberg, Natthida Owattanapanich, Brent Emigh, Lindsey Karavites, Damon H. Clark, Lydia Lam, Kenji Inaba.*** **From LAC + USC Medical Center.**

Background: Focused Assessment with Sonography for Trauma (FAST) has supplanted diagnostic peritoneal lavage (DPL) as the preferred bedside evaluation for traumatic hemoperitoneum. Diagnostic peritoneal aspiration (DPA) is a simpler, faster modification of DPL with an unclear role in contemporary practice. This study delineated modern roles for DPA and defined its diagnostic yield. **Methods:** All trauma patients presenting to our Level 1 trauma centre who underwent DPA were included (May 2015–May 2020). Demographics, comorbidities, clinical/injury data, and outcomes were collected. The diagnostic yield and accuracy of DPA were calculated against the gold standard of hemoperitoneum at exploratory laparotomy or CT scan. **Results:** In total, 41 patients underwent DPA, typically after blunt trauma (n = 37, 90%). Patients were almost exclusively hypotensive (n = 20, 49%) or in arrest (n = 18, 44%). Most patients had an equivocal or negative FAST and hypotension or return of spontaneous circulation after resuscitative thoracotomy (n = 32, 78%), or had a positive FAST and known cirrhosis (n = 4, 10%). In 2 patients (5%), 1 obese, the catheter failed to access the peritoneal cavity. DPA sensitivity, specificity, positive predictive value, and negative predictive value were 80%, 100%, 100%, and 90%, with an accuracy of 93%. One (2%) complication, a small bowel injury, occurred. **Conclusion:** Despite near ubiquitous FAST availability, DPA remains important in diagnosing or excluding hemoperitoneum with exceedingly low rates

of failure and complications. DPA is most conclusive when positive, without false positives in this study. DPA was used most among blunt hypotensive or post-arrest patients who had an equivocal or negative FAST, in whom the preliminary diagnosis of hemoperitoneum is a critically important decision-making branch point.

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Impact of delayed time to first head CT in traumatic brain injury. ***Morgan Schellenberg, Elizabeth R. Benjamin, Natthida Owattanapanich, Kenji Inaba, Demetrios Demetriades.*** **From LAC + USC Medical Center.**

Background: Trauma team activation (TTA) criteria trigger early mobilization of resources for the sickest trauma patients. Patients with moderately depressed Glasgow Coma Scale (GCS) scores who do not trigger the highest level activation are at risk for adverse outcomes, potentially from delayed time to intervention. The study objective was to define the impact of time to first head CT on outcomes among blunt trauma patients with moderately depressed GCS scores. **Methods:** Patients from the Trauma Quality Improvement Program (TQIP) databank (2013–2016) with a GCS score of 9–12 in the emergency department (ED) were included. Transfers, penetrating mechanisms, death < 24h, Abbreviated Injury Scale (AIS) score = 6 in any body region, and patients with severe associated injuries were excluded. Study groups were defined by time to first head CT after ED arrival: immediate (≤ 1h) v. delayed (1–6h). Primary outcomes were time to neurosurgical intervention and time to ED discharge. **Results:** After exclusions, 4997 patients were identified. Of these, 79% (n = 3954) underwent immediate head CT and 21% (n = 1043) had delayed head CT. Median GCS score was 11 [10–12] in both groups and there was no difference in median head AIS score (4 [3–4] v. 4 [3–4], p = 0.586). Time to craniotomy and intracranial pressure (ICP) monitor insertion were longer in the delayed group (4.2h [3.0–7.6] v. 3.1h [2.1–8.7], p = 0.001; and 5.7h [3.8–13.0] v. 4.4h [2.6–12.0], p = 0.008), as was time in the ED (4.3h [2.7–6.5] v. 2.1h [1.2–3.7], p < 0.001). There was no difference in need for craniotomy (11% v. 10%, p = 0.287), need for ICP monitor (12% v. 12%, p = 0.899), or mortality (11% v. 9%, p = 0.160). On multivariate analysis, age > 65 years (odds ratio [OR] 2.813, p < 0.001), systolic blood pressure < 90 mm Hg (OR 2.934, p < 0.001), ED intubation (OR 1.486, p = 0.001), and head AIS scores of 4 (OR 1.884, p < 0.001) and 5 (OR 6.729, p < 0.001) were independently associated with death. **Conclusion:** Immediate head CT for blunt trauma patients with moderately depressed GCS scores decreases time to intervention and reduces ED time. A protocol to shorten time to head CT may be beneficial for both patients and hospitals.

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Radiologic predictors of in-hospital mortality after traumatic craniocervical dissociation. ***Morgan Schellenberg, Geoffrey A. Anderson, Natthida Owattanapanich, Vincent Cheng, Lydia Lam, Kenji Inaba, Lee Myers.*** **From LAC + USC Medical Center.**

Background: Traumatic craniocervical dissociation (CCD) is the forcible dislocation of the skull from the vertebral column. Because most CCD patients die on scene, prognostication for those arriving alive to hospital is challenging. The study objective was to determine if greater dissociation, based on radiologic measurements of CCD, is predictive of in-hospital mortality among patients surviving to the emergency department (ED). **Methods:** All trauma patients arriving to our Level 1 trauma centre (January 2008–April 2019) with CCD were retrospectively identified and included. Transfers and patients without CT of the head/cervical spine were excluded. Patients were dichotomized into study groups based on in-hospital mortality. Radiologic measurements of degree of CCD were performed based on the index CT scan by an attending radiologist with emergency radiology fellowship training. Measurements were compared between patients who died in hospital and those who survived. **Results:** After exclusions, 36 patients remained: 12 (33%) died and 24 (67%) survived. Median age was 55 [30–67] v. 44 [20–61] years (p = 0.199). Patients who died had higher Injury Severity Scores (39 [31–71] v. 27 [14–34], p = 0.019) and Abbreviated Injury Scale (AIS) head/neck scores (5 [5–5] v. 4 [3–4], p = 0.001) than survivors. The only radiologic measurement that differed between groups was greater soft tissue edema at mid C1 among patients who died (12.37 [7.60–14.95] v. 7.86 [5.25–11.61], p = 0.013). Receiver operating characteristic curve analysis of soft tissue edema at mid C1 and mortality revealed ≥ 10.86 mm of soft tissue width predicted mortality with sensitivity and specificity of 0.75. All other radiologic parameters, including the basion–dens interval, were comparable between groups (p > 0.05). **Conclusion:** Among patients who arrived alive to hospital after traumatic CCD, greater radiologic dissociation was not associated with increased mortality. However, increased soft tissue edema at the level of mid C1, particularly ≥ 10.86 mm, was associated with in-hospital death. These findings improve understanding of this highly lethal injury and impart the ability to better prognosticate for patients arriving alive with CCD.

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Measurement properties of a patient-reported instrument to evaluate functional status after major surgery. ***Julian Daza, Brian Cuthbertson, Paul Myles, Mark Shulman, Duminda Wijeysundera.*** **From University of Toronto (Daza, Cuthbertson, Wijeysundera) and Monash University (Myles, Shulman).**

Background: Expert recommendations propose the World Health Organization Disability Assessment Schedule (WHODAS) 2.0 as a core outcome measure in surgical studies, yet data on its long-term measurement properties remain limited. The WHODAS can be used to measure postoperative functional status, which characterizes how surgery might alter an individual's ability to perform normal daily activities. **Methods:** We conducted a secondary analysis of the Measurement of Exercise Tolerance before Surgery (METS) multicentre cohort of adults (≥ 40 yr) who underwent inpatient noncardiac surgery. The 12-item WHODAS 2.0 and EuroQoL Five Dimension (EQ-5D) questionnaires were administered before surgery and 1 year afterwards. Responsiveness was characterized using standardized response

means (SRMs) and correlation coefficients between change scores of WHODAS and EQ-5D. Construct validity was evaluated using correlation coefficients between 1-year scores of both questionnaires, and comparisons of 1-year WHODAS scores across clinically relevant subgroups. **Results:** The cohort included 546 patients from Canada, New Zealand, and Australia. There was moderately strong correlation between changes in both questionnaires. The strongest correlation was between changes in WHODAS and changes in the functional subscales of the EQ-5D; for example, mobility (Spearman ρ 0.40, 95% confidence interval [CI] 0.32–0.48) and usual activities (ρ 0.45, 95% CI 0.30–0.52). When compared across quartiles of EQ-5D change, median WHODAS scores followed expected patterns of change. In subgroups with expected functional status changes, the WHODAS SRMs ranged from "small" to "large" in the expected directions of change. At 1 year, the WHODAS demonstrated convergence with EQ-5D functional subscales, and good discrimination between patients with expected differences in functional status. **Conclusion:** The 12-item WHODAS 2.0 has construct validity and responsiveness as a measure of functional status at 1 year after major surgery. Our findings support perioperative guideline recommendations for the WHODAS to become a patient-centred core outcome measure in surgical research.

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The safety of venous thromboembolism chemoprophylaxis use in endoscopic retrograde cholangiopancreatography. ***Lyndsay T. Glass*, *Patrick B. Murphy*, *Laura Allen*, *Kathryn Minkhorst*, *Dillon Bowker*, *Ephraim S. Tang*, *Kenneth Leslie*, *Jeffrey E. Hawel*. From Western University (Glass, Allen, Minkhorst, Tang, Leslie, Hawel), Medical College of Wisconsin (Murphy), and Dalhousie University (Bowker).**

Background: Endoscopic retrograde cholangiopancreatography (ERCP) is a frequently used technique to treat biliary and pancreatic diseases in the inpatient setting. Society guidelines recommend that venous thromboembolism (VTE) chemoprophylaxis be administered broadly to inpatients to prevent VTE. However, ERCPs have been identified as a high-risk procedure for hemorrhage by the American Society of Gastroenterologists, and cessation of VTE chemoprophylaxis around the time of ERCP is recommended. **Methods:** We designed a retrospective study to assess the risk of bleeding in inpatient ERCPs associated with the use of VTE chemoprophylaxis at our high-volume centre. We identified all inpatient ERCPs that occurred between June 2015 and May 2019. We excluded patients who were prescribed therapeutic anticoagulation, diagnosed with VTE in the preceding 3 months, missing medication administration records before ERCP, and aborted procedures without attempt at sphincterotomy. VTE continuation was defined as administration of VTE chemoprophylaxis within 24h of the start of the procedure. We defined bleeding as clinical signs of bleeding, completion of a procedure to stop bleeding, and a decrease in hemoglobin > 20 g/L within 24h of ERCP. **Results:** Our study included 479 inpatient ERCPs. Eleven procedures were complicated by a post-procedure bleed; however, there was no statistically significant difference in bleeding in the continuation group (3.0%) compared with the cessation group (1.8%; $p = 0.374$), nor was there an increase in severity. Further VTE chemoprophylaxis did not result in an increase in bleeding complications when a formal sphincterotomy was completed. **Conclusion:** Despite current guideline recommendations, our study suggests that the continuation of VTE chemoprophylaxis in ERCP is safe. This is an important distinction to make as VTE is an important and frequent cause of inpatient morbidity and mortality.

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Characterizing Canadian rural surgeons: trends over time and 10-year replacement needs. ***Kevin Verhoeff*, *Odelle Ma*, *Kieran Purich*, *Samuel Skinner*, *Raveena Dhaliwal*, *Matt Strickland*. From the University of Alberta.**

Background: Recruiting and preparing residents to practise in rural communities begins with an accurate characterization of current rural surgeons and future employment prospects. We aimed to characterize rural Canadian surgeons and to predict the rural workforce requirements for the next decade. This cross-sectional observational study evaluated Canadian rural general surgeons, characterized by surgeons working in a city with population < 100 000. **Methods:** Surgeons were identified using provincial college websites and the 2015 Canadian Association of General Surgeons database. Demographics included year and country of medical degree (MD) achievement, and fellowship status. A predictive model for future rural employment opportunities was developed on the following assumptions: (1) the current number of rural surgeons per capita is adequate, (2) the rural population will increase 1.1% annually, (3) estimated career length is 36 years following MD conferment, and (4) 85.4 new graduates will enter the workforce annually. **Results:** We evaluated 606 rural Canadian general surgeons. The majority graduated after 1989 (73%), were Canadian medical graduates (74%) and did not complete a fellowship (82%). When stratified by graduation year, 91% of surgeons with degrees since 2009 were Canadian-trained, compared with 53% of surgeons with degrees before 1980 ($p < 0.001$). **Conclusion:** Using the prediction model, an estimated 239 rural surgeons will retire by 2031 and 70 additional surgeons will be needed to account for population growth. In total, there will be a demand for 309 new rural surgeons over the next 10 years, meaning 33% of general surgery graduates will need to enter rural practice to maintain the current Canadian rural surgery workforce. Canadian rural surgeons vary widely in their background and demographics. Future opportunities in rural surgery are projected to increase. These findings suggest that residency programs need more rural-specific training to encourage trainees to serve Canada's rural communities.

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Contextual interference for skills development and transfer in laparoscopic surgery: a randomized controlled trial. ***Garrett Johnson*, *Jason Park*, *Ashley Vergis*, *Lawrence Gillman*, *Justin Rivard*. From University of Manitoba (Johnson, Vergis, Gillman, Rivard) and University of British Columbia (Park).**

Background: Past education literature has shown benefits for random practice schedules (termed contextual interference) for skills retention and transfer to novel tasks. The purpose of fundamentals of laparoscopic surgery (FLS) training is to develop skills in simulation and transfer to new in vivo intraoperative experiences. The study objective was to assess whether individuals trained over a fixed number of trials in the FLS tasks would outperform untrained controls on an unpractised previously validated bile duct cannulation task and scoring system, and to determine whether random training schedules conferred any relative advantage. **Methods:** Forty-four trainees with no laparoscopic experience were recruited to participate. Thirty-five were randomized to practise the FLS tasks using either a blocked or random training schedule. Nine were randomized to no additional training (controls). Participant performance was measured throughout training to monitor skills acquisition, and participants were then tested on an unpractised bile-duct cannulation simulation task 4–6 weeks later. Outcomes included previously validated FLS scores and hand-motion analyses. **Results:** All 44 participants completed the study. Trained individuals in both groups showed significant improvements in all FLS tasks after training. There were no differences between groups in performance on the cannulation task median scores (blocked: 89.8 [interquartile range (IQR) 37.6]; random: 83.2 [32.3]; control: 83.6 [19.1]; $p = 0.955$), number of hand motions (blocked: 42.5 [IQR 130.3]; random: 75.3 [111.3]; control: 63.0 [71.8]; $p = 0.912$), or distance travelled by participants' hands (blocked: 2.0 [IQR 5.8]; random: 3.8 [8.9]; control: 2.6 [2.5]; $p = 0.816$). Cannulation task performance had no correlation with total FLS performance (R^2 linear = 0.014, $p = 0.445$). **Conclusion:** Skills acquired from conventional FLS tasks did not effectively transfer to a laparoscopic bile-duct cannulation task. Neither blocked nor random practice schedules conferred a relative advantage. These findings provide evidence that cannulation is a distinct skill from what is taught and assessed in FLS.

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Evaluating the accuracy and design of visual backgrounds in academic surgical journals. ***Keegan Guidolin*, *Justin Lin*, *Anudari Zorigtbaatar*, *Minahil Nadeem*, *Tarek Ibrahim*, *Zdenka Neilson*, *Kyung Young (Peter) Kim*, *Luckshi Rajendran*, *Sami Chadi*, *Fayez Quereshy*. From University of Toronto (Guidolin, Lin, Ibrahim, Kim, Rajendran, Chadi, Quereshy), McGill University (Zorigthaatar), McMaster University (Nadeem), and Western University (Neilson).**

Background: The objective of this study was to assess the quality and accuracy of visual backgrounds published in academic surgical journals. Visual backgrounds are commonly used to disseminate medical research findings. They distill the key messages of a research article, presenting them graphically in an engaging manner so that potential readers can decide whether to read the complete manuscript. **Methods:** We developed a Visual Background Assessment Tool based upon published guidelines. Seven reviewers underwent iterative training to apply the tool. We collected visual backgrounds published by 25 surgical journals from January 2017 to April 2021; those corresponding to systematic reviews without meta-analysis, conference backgrounds, narrative reviews, video backgrounds, or nonclinical research were excluded. Included visual backgrounds were scored on accuracy (as compared with written backgrounds) and design and were given a "first impression" score. **Results:** Across 25 surgical journals, 1325 visual backgrounds were scored. We found accuracy deficits in the reporting of study design (35.8%), appropriate icon use (49%), and sample size reporting (69.2%) as well as design deficits in element alignment (54.8%) and symmetry (36.1%). Overall scores ranged from 9 to 14 (out of 15), accuracy scores ranged from 4 to 8 (out of 8), and design scores ranged from 3 to 7 (out of 7). No predictors of visual background score were identified. **Conclusion:** Visual backgrounds vary widely in quality. As visual backgrounds become integrated with the traditional components of scientific publication, they must be held to similarly high standards. We propose a checklist to be used by authors and journals to standardize the quality of visual backgrounds.

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Defining rural surgery in Canada. ***Lyndsay T. Glass*, *Malcolm Davidson*, *Emily Friedrich*, *Caitlin Champion*. From Western University (Glass), University of Toronto (Davidson), University of British Columbia (Friedrich), and Northern Ontario School of Medicine (Champion).**

Background: Approximately 18%–30% of the Canadian population live in a rural area and are served by 8% of general surgeons. The demographics and geography of rural Canada greatly impact the health outcomes and needs of this population. The rural general surgeons who live and work in these areas hold a unique role in these communities; they serve the diverse needs of rural populations. As a result, rural general surgery is a distinct area of practice. **Methods:** We set out to review the literature available to assess any prior definitions of rural surgery and any available descriptions of rural practice to help formulate our own definition of the Canadian rural general surgeon. Our literature review was assisted by a medical librarian, and we limited our review to literature from North America and Australia owing to the geographic similarities. **Results:** We did not identify a formal definition of rural surgery. Much of the research used population cut-offs or state-based population codes, combining community size and proximity to a larger centre to define rurality. The literature also focused on the broader scope of practice of rural surgeons beyond core general surgery, often incorporating gastroenterology, obstetrics and gynecology, and orthopedic surgery among others. We worked to incorporate a definition of rurality in the context of Canadian geography and health care systems. **Conclusion:** Based on the available descriptions of rural general surgery and the definitions of rurality employed in Canadian health policy, the definition of a rural general surgeon in Canada encompasses population size, limited influence of metropolitan centres, and their varied scope of practice beyond core general surgery.

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Validity of video-based general and procedure-specific self-assessment tools for surgical trainees in laparoscopic cholecystectomy. ***Saba Balvardi*, *Koorosh Semsar-Kazerooni*, *Pepa Kaneva*, *Carmen Mueller*, *Melina Vassiliou*, *Mohammed Al Mahroos*, *Julio Fiore Jr.*, *Kevin Schwartzman*, *Liane Feldman*. From McGill University.**

Background: Self-review of recorded surgical procedures offers new opportunities for trainees to extend technical learning outside the operating room. Valid tools for self-assessment are required before evaluating the effectiveness of video-review in enhancing technical learning. Therefore, we aimed to contribute evidence regarding the validity of intraoperative performance assessment tools for video-based self-assessment by general surgery trainees when performing laparoscopic cholecystectomies. **Methods:** Using a Web-based platform, general surgery trainees in a university-based residency program submitted recorded laparoscopic cholecystectomy procedures where they acted as the supervised primary surgeon. Attending surgeons measured operative performance at the time of surgery using general and procedure-specific assessment tools (GOALS and OPRS, respectively) and entrustability level (O-SCORE). Trainees self-evaluated their performance from video-review using the same instruments. The validity of GOALS and OPRS for trainee self-assessment was investigated by testing the hypotheses that self-assessment scores correlate with (H1) expert assessment scores, (H2) O-SCORE, and (H3) procedure time, and that (H4) self-assessment based on these instruments differentiates junior (post-graduate year [PGY] 1–3) and senior trainees (PGY4–5), as well as (H5) simple (visual analogue scale [VAS] ≤ 4) versus complex cases (VAS > 4). All hypotheses were based on previous literature, defined a priori, and were tested according to the COSMIN consensus on measurement properties. **Results:** A total of 35 videos were submitted (45% female and 45% senior trainees) and self-assessed. Our data supported 2 out of 5 hypotheses (H1 and H4) for GOALS and 3 out of 5 hypotheses (H1, H4 and H5) for OPRS, for trainee self-assessment. **Conclusion:** OPRS, a procedure-specific assessment tool, was better able to differentiate between groups expected to have different levels of intraoperative performance, compared with GOALS, a general assessment tool. Given the interest in video-based learning, there is a need to further develop valid procedure-specific tools to support video-based self-assessment by trainees in a range of procedures.

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Examining the equity and diversity characteristics of academic general surgeons in Canada. ***Nada Gawad, Kieran Purich, Kevin Verhoeff, Blaire Anderson*****. From the University of Alberta.**

Background: Surgeon underemployment and job competition emphasize the importance of equitable hiring practices. The purpose of this study was to characterize the demographics of academic general surgeons across Canada and evaluate recently hired surgeons with respect to equity and diversity to assess the current status and recent trends. **Methods:** The demographics of academic general surgeons across Canada, including gender, visible minority (VM) status, practice location, and graduate degree status were collected. Location of residency was collected for recently hired surgeons, defined as those hired between 2013 and 2020. Descriptive statistics captured the demographics at each institution. Pearson r and hypothesis testing was used to determine the correlation between population metrics and gender or VM status. **Results:** We included 393 general surgeons from 30 academic hospitals spanning 14 universities. Hospitals ranged from having 0% to 47.4% female surgeons and 0% to 66.7% VM surgeons. This heterogeneity did not correlate to the number of general surgeons within the hospital (gender: $r = 0.05$, $p = 0.79$; VM: $r = –0.22$, $p = 0.24$) or the size of the city (gender: $r = 0.04$, $p = 0.83$; VM: $r = 0.04$, $p = 0.85$). The proportion of VM surgeons at each hospital also did not correlate to the proportion of VM population within the respective city ($r = 0.13$, $p = 0.51$). Only 28.5% (34/120) of recently hired academic surgeons did not have a graduate degree. Approximately 1.5 times the proportion of recently hired male versus female academic surgeons did not have a graduate degree. **Conclusion:** Diversity in the Canadian surgical workforce is a strength, and equity in hiring is imperative. Graduating surgeons and hiring committees need to understand how factors such as demographics and graduate degree status may impact hiring decisions. We must be willing to examine and be transparent with our processes to build an equitable surgical workforce.

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Video-based coaching for surgical residents: a systematic review and meta-analysis. ***Tyler McKechnie, Ryan Daniel, Colin Kruse, Marc Levin, Yung Lee, Aristithes Doumouras, Dennis Hong, Cagla Eskicioglu*****. From McMaster University (McKechnie, Kruse, Lee, Doumouras, Hong, Eskicioglu) and University of Toronto (Daniel, Levin).**

Background: Video-based coaching (VBC) is used to supplement current teaching methods in surgical education and may be useful in competency-based frameworks. Whether VBC can effectively improve surgical skill in surgical residents has yet to be fully elucidated. The objective of this study was to compare surgical residents receiving and not receiving VBC in terms of technical surgical skill. The following databases were searched from inception through to October 2021: Medline, EMBASE, Cochrane Central Register of Controlled Trials (CENTRAL), and PubMed. Articles were included if they were randomized controlled trials (RCTs) comparing surgical residents receiving and not receiving VBC. The primary outcome was change in objective measures of technical surgical skill following implementation of either VBC or control. **Methods:** A pairwise meta-analyses using inverse variance random effects was performed. Standardized mean differences (SMDs) were used as the primary outcome measure to account for differences in objective surgical skill evaluation tools. **Results:** From 2734 citations, 11 RCTs with 157 residents receiving VBC and 141 residents receiving standard surgical teaching without VBC were included. The majority of included residents were junior residents (75.8%) and general surgery residents (59.0%). There was no significant difference in post-coaching scores on objective surgical skill evaluation tools between groups (SMD 0.53, 95% confidence interval [CI] 0.00–1.01, $p = 0.05$, $I^2 = 74\%$). The improvement in scores pre- and post-intervention was significantly greater in residents receiving VBC compared with those not receiving VBC (SMD 1.62, 95% CI 0.62–2.63, $p = 0.002$, $I^2 = 85\%$). These results were unchanged with leave-one-out sensitivity analysis and subgroup analysis according to operative setting. **Conclusion:** VBC can improve objective surgical skills in surgical residents of various levels. The benefit may be most substantial for trainees with lower baseline levels of objective skill and more junior trainees. Further studies are required to determine the impact and feasibility of VBC on competency-based frameworks.

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Very-low-energy diets prior to nonbariatric surgery: a systematic review and meta-analysis. ***Tyler McKechnie, Christopher Povolo, Jay Lee, Yung Lee, Lily Park, Aristithes Doumouras, Dennis Hong, Mohit Bhandari, Cagla Eskicioglu.*** **From McMaster University.**

Background: Very-low-energy diets (VLEDs) serve as an intensive approach to weight loss in a short period of time. While the preoperative use of VLEDs to optimize obese patients before bariatric surgery is well established, the evidence for VLEDs before other types of surgery remains unclear. The aim of this review was to determine the impact of preoperative VLEDs on perioperative outcomes in nonbariatric surgery, particularly for patients undergoing oncologic resection. Medline, EMBASE, CENTRAL, and PubMed were systematically searched. **Methods:** Articles were included if they evaluated VLED utilization before any type of nonbariatric surgery. The primary outcome was postoperative morbidity. Secondary outcomes included compliance, safety, and preoperative weight loss. A pairwise meta-analyses using inverse variance random effects was performed. From 792 citations, 13 studies (4 randomized controlled trials) with 395 patients (mean age 56.5 yr, 55.8% female) receiving VLED preoperatively in preparation for nonbariatric surgery were included. **Results:** Hepatectomy and gastrectomy were the most common surgical interventions. Mean duration of preoperative VLED was 6.6 weeks. The most employed liquid VLED formulation was Optifast. Target daily caloric intake ranged from 450 kcal to 1400 kcal. Compliance with VLED ranged from 94% to 100%. Mean preoperative weight loss ranged from 3.2 kg to 19.2 kg. There were no significant differences in postoperative morbidity (odds ratio [OR] 1.10, 95% confidence interval [CI] 0.64 to 1.91, $p = 0.72$), operative time (standardized mean difference [SMD] –0.35, 95% CI –1.13 to 0.43, $p = 0.38$), or postoperative length of stay (SMD 0.40, 95% CI –0.11 to 0.91, $p = 0.12$) for patients receiving VLEDs compared with those not receiving VLEDs. Six studies evaluated patients undergoing oncologic operations, and there were no significant differences in these data compared with data from operations for benign disease. **Conclusion:** While currently available evidence is heterogeneous, preoperative VLEDs are safe, well tolerated, and effectively induce preoperative weight loss in patients undergoing nonbariatric surgery for both benign and malignant disease. Further prospective studies are warranted.

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Factors associated with resident research success: a descriptive analysis of Canadian general surgery trainees. ***Kieran Purich, Esther Lee, Kevin Verhoeff, Dasan Sydora, Simon Turner, Matt Strickland.*** **From the University of Alberta.**

Background: Research productivity is considered when applying for fellowship and surgical staff positions. The effect that different resident and residency program characteristics have in fostering research output is unknown. Our objective was to characterize research productivity for current Canadian general surgery residents and evaluate the individual and program characteristics associated with residents' research quantity and impact. **Methods:** A cross-sectional, observational study was completed evaluating English-speaking Canadian general surgery residency programs. A list of all Canadian general surgery residents was generated from publicly available sources, and research-related metrics, including number of publications, authorship position and CiteScore, were collected using the SCOPUS database. Between-program differences were evaluated by analysis of variance. Research productivity was described using publications per postgraduate year (PGY), number of first author publications and median CiteScore. A multivariable logistic regression analysis was used to evaluate factors associated with research productivity. Residency program characteristics evaluated included the program size (small ≤ 20 residents; medium 21–40 residents; large ≥ 41 residents), mandatory research requirements, presence of a mandatory research block and the presence of a formal research curriculum. Resident factors included their graduate degree status and if they had published before residency. **Results:** We observed a range of resident research productivity across the country with the mean total publications per PGY of each program ranging from 0.1 to 1.1, and the median CiteScore ranging from 0.5 to 3.6. On multivariable analysis, graduate degrees and publications before residency were significantly associated with a greater number of publications per PGY (odds ratio [OR] 3.3, 95% confidence interval [CI] 2.1–5.1, $p < 0.001$) and higher median CiteScore (OR 2.3, 95% CI 1.5–3.4, $p < 0.001$). **Conclusion:** No residency program factors had a significant impact on research productivity. We demonstrate a wide range in research output by general surgery residents across Canada. Pursuit of a graduate degree and the experience of publication before residency are associated with higher research productivity.

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Global surgery pilot curriculum in Canadian undergraduate medical education: a novel approach. ***Jessica Henley, Darrell Boone, Stephanie Roberts.*** **From Memorial University of Newfoundland.**

Background: To the best of our knowledge, no Canadian medical schools have integrated global surgery into their undergraduate medical education (UGME) curricula, despite growing interest. The literature has long advocated for incorporating global surgery into curricula to ensure exposure and comprehension of evidence-based teaching of global surgery objectives. Owing to inconsistencies in guidelines for incorporating the topic into medical education, students' experiences with global surgery initiatives vary greatly. Our objective was to assess medical students' reception of a global surgery case-based session in terms of improvement of knowledge, familiarity and insight. **Methods:** A 3-hour session involving global surgery-related cases was incorporated into the Integrated Learning Session (ILS) of a UGME curriculum. Second-year medical students ($n = 80$) attended the session and were divided into subgroups. After the session, a retrospective survey including Likert-style and open-ended questions was distributed to group leaders ($n = 9$). Data were analyzed using summary statistics and thematic analysis and reported following the Standards for Reporting Qualitative Research

(SRQR). **Results:** Qualitative data analysis revealed 4 overarching themes: improvement in global surgery knowledge, shift in treatment approach, relevance of global inequities, and implications of minimal access to resources. Based on the analysis of Likert data, students' knowledge of global surgery had increased, and the session integrated the social determinants of health better than previous sessions. All respondents agreed that this session should remain as a permanent part of the curriculum. **Conclusion:** The session was proven to increase knowledge of global surgery in UGME. Students reported that the session encouraged critical thinking and altered their perceptions of treating patients in settings with limited resources and access to care. The session was well received by all respondents, and their feedback from this analysis is being incorporated into the study's second iteration, scheduled for June 2022.

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How useful is ultrasound in predicting surgical findings of "mild cholecystitis"? ***Emma Imbert, Duncan McGrouther, Paul Manuel.*** **From the University of Otago — Invercargill Campus.**

Background: Ultrasound is used to aid in the diagnosis of acute cholecystitis (AC). We looked at the usefulness of ultrasound in predicting "mild cholecystitis" compared with surgical and pathological severity of AC. A retrospective cohort study was performed across cholecystectomy patients at our centre between 2017 and 2019 who received an ultrasound within 3 days before surgery. **Methods:** Ultrasounds were separated into "mild cholecystitis on ultrasound" (MCUS) and a control group. MCUS included reports that stated "early cholecystitis," "potential cholecystitis" and "no definitive cholecystitis." Intraoperative findings were retrospectively graded as either normal appearance, mild inflammation, or gross to severe inflammation and compared with pathology reports. **Results:** Ninety-six patients met the inclusion criteria; 48 were in the MCUS group. Of these, 22 had operative findings of gross to severe inflammation, 18 mild inflammation and 8 normal anatomy. Twelve of the operative gross to severe inflammation category had pathology consistent with AC, 4 of the mild inflammation category, and 0 of the normal appearance category. Three patients had their surgery converted to open. No other complications were recorded. In comparison, of the 48 patients whose ultrasound was reported as AC (not "mild"), 40 had operative descriptions as gross to severe inflammation (39 AC on pathology), 6 mild inflammation (2 AC) and 2 normal appearance (0 AC). Seven complications were recorded. **Conclusion:** Reports of MCUS should be approached with caution, not least because there is no agreed upon criteria for MCUS. We found 46% of MCUS had operative findings of gross to severe inflammation (compared with 83% of those not reported as mild). Therefore, operative complexity is difficult to predict on ultrasound.

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Implementing a colorectal surgery "virtual hospital": description of a novel outpatient care pathway to advance surgical care. ***Christine Li, Mark Dykstra, Haili Wang, Ryan Snelgrove.*** **From the University of Alberta.**

Background: The COVID-19 pandemic has highlighted the potential of virtual health care to improve the delivery of care to surgical patients. Reducing use of inpatient resources in favour of outpatient care for select patients can reduce the surgical backlog and increase the likelihood that patients undergo operations in a timely manner. **Methods:** We developed a virtual hospital (VH) pathway for select colorectal surgery patients, who would otherwise be admitted postoperatively, to receive care at home and be discharged as day surgery procedures. This pathway utilizes remote automated monitoring (RAM) with the Cloud Dx Pulsewave equipment to allow patients to be followed at home postoperatively. RAM equipment allows the collection of vital signs and patient concerns remotely, and regular nursing follow-up is arranged via telehealth. This pathway relies on adequate preoperative patient education, multidisciplinary planning, and use of a Mobile Integrated Health Field Team (MIH Team) that visits patients to perform clinical assessments and draw bloodwork. If any concerns arise, the patient may be brought into hospital for assessment by the MIH Team or the colorectal surgeon will discuss the patient at dedicated daily VH rounds. **Results:** At the time of writing, 6 patients have been managed via the VH care pathway and enrolment is ongoing. These patients have undergone operations such as loop ileostomy closure, laparoscopic right hemicolectomy, or laparoscopic small bowel resection. **Conclusion:** The VH pathway is an innovative system to decrease inpatient hospital resource utilization while providing high-quality, safe, patient-centred care at home. Further development of this care pathway has the potential to change current practice to expand cases that meet day surgery criteria, allow patients to recover at home, and maximize health care resource use and efficacy.

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Trends in training and workforce planning for Canadian pediatric surgeons: a 10-year model. ***Samuel Skinner, Kevin Verhoeff, Kieran Purich, Troy Perry, Matthew Strickland, Raveena Dhaliwal.*** **From the University of Alberta.**

Background: Canadian pediatric surgeon training and trends over time remain uncharacterized. Similarly, updated evaluation of workforce planning for pediatric surgeons is required. We aimed to characterize graduate degree and fellowship trends for Canadian pediatric surgeons, with modelling to inform workforce planning. **Methods:** We performed a cross-sectional observational study evaluating Canadian pediatric surgeons in January 2022. A list of surgeons was generated through provincial college websites. Demographics including year of medical degree (MD) conferment, MD training location, fellowship training location, and graduate degrees were collected and dual-confirmed through college websites and direct contact. Training characteristics are presented and evaluated over time. A model characterizing 2021–2031 pediatric surgeon supply and demand was constructed to evaluate workforce planning. Supply was extrapolated from current Canadian pediatric surgery fellows assuming static fellowship matriculation, while retirement was estimated using a 31-, 36-, or 41-year career following MD conferral as per previous literature. **Results:** Of included surgeons (n = 70), 57 (81.4%) completed their fellowship training in Canada and 45 (64.3%) have graduate degrees. Significant

changes have occurred over time, with only 1 (20%) surgeon with an MD before 1980 having a graduate degree, compared with 8 (100%) surgeons with an MD after 2011 ($p < 0.001$). Similarly, a growing number of pediatric surgeons with an MD after 2011 appear to have a Canadian MD ($n = 7$, 87.5%) and Canadian fellowships ($n = 8$, 100%). Modelling predicts 18–39 (25%–55%) surgeons will retire between 2021 and 2031, while 99 fellows are expected to graduate, creating a 60- to 81-surgeon surplus. **Conclusion:** Trends in graduate degree achievement and fellowship location suggest increasing competition for Canadian pediatric surgery positions. The increasing competition is occurring within the context of potential overtraining, with an estimated 60–81 fellows requiring positions outside of Canada in the next 10 years, representing 85.7% to > 100% of current pediatric surgeons.

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Patient perspectives on intraoperative blood transfusion: results of semistructured interviews with perioperative patients. ***Tori Lenet, Stephanie Skanes, Joseph Tropiano, Daniel McIsaac, Alan Tinmouth, Julie Hallet, Stuart Nicholls, Dean Fergusson, Guillaume Martel.*** **From University of Ottawa (Lenet, Skanes, Tropiano, McIsaac, Tinmouth, Martel), University of Toronto (Hallet), and The Ottawa Hospital Research Institute (Nicholls, Fergusson).**

Background: Red blood cell (RBC) transfusions are commonly given during surgery. An understanding of patient perceptions of intraoperative RBC transfusions is lacking. The objective was to understand patient perceptions regarding intraoperative RBC transfusion and explore their willingness to engage in transfusion-prevention strategies. **Methods:** Semistructured interviews were conducted with patients before major operations, and with other patients who had recently undergone major surgery. Purposive sampling was used to select patients from varying backgrounds and perioperative courses, including the need for transfusion and presence of postoperative anemia. Inductive thematic analysis was conducted to identify major themes. **Results:** Twenty patients (9 preoperative and 11 postoperative) were interviewed. After analysis, the following themes were identified: risk–benefit perception of transfusion, acceptance of transfusion prevention interventions, communication, transfusion acceptance, trust in professional judgment, and patient involvement in transfusion decisions. Overall, patients perceived transfusions as low risk, particularly in the larger context of their surgical intervention. Factors influencing transfusion acceptance included trust in the health care system and blood screening process, and the perception of treatability of transfusion-related complications. Many patients preferred to defer intraoperative transfusion decision-making to the surgical team, citing trust in professional judgment and training and a good pre-existing relationship with their surgeon as reasons that they felt comfortable delegating this decision. Some expressed their desire to have their preferences incorporated into intraoperative transfusion decisions. Others expressed the desire for a more detailed preoperative blood consent conversation, and most were open to hearing about and participating in strategies to minimize the risk of intraoperative transfusion. **Conclusion:** Perioperative patients consider intraoperative transfusions as low-risk, high-reward interventions, and generally trust the health care system and surgical team to guide intraoperative transfusion decision-making. However, preoperative blood consent discussions were superficial, brief, and lacked nuance. Targeted strategies are required to improve preoperative blood consent discussions and integrate patient preferences into intraoperative transfusion decisions.

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Understanding intraoperative transfusion decision-making variability: a qualitative study using the Theoretical Domains Framework. ***Tori Lenet, Joseph Tropiano, Stephanie Skanes, Victoria Ivankovic, Daniel McIsaac, Alan Tinmouth, Andrea Patey, Dean Fergusson, Guillaume Martel.*** **From University of Ottawa (Lenet, Tropiano, Skanes, Ivankovic, McIsaac, Tinmouth, Martel) and The Ottawa Hospital Research Institute (Patey, Fergusson).**

Background: Red blood cell (RBC) transfusions are commonly given during surgery. There is evidence of significant variation in intraoperative transfusion practice among clinicians. Although some variation is expected based on case mix, wide variation that cannot be explained by disease severity or patient preference likely reflects unwarranted variation in clinical care. The purpose of this work was to understand the beliefs of anesthesiologists and surgeons that underlie intraoperative transfusion decisions. **Methods:** Twenty-eight physicians (16 anesthesiologists and 12 surgeons) were recruited internationally. An interview guide was developed based on the Theoretical Domains Framework (TDF) to identify beliefs about intraoperative RBC transfusion. Content analysis was performed to group physicians' statements into the relevant theoretical domains. Relevant domains were selected based on the frequency of beliefs reported, the perceived influence on intraoperative transfusion behaviour, and the presence of conflicting beliefs. **Results:** Six domains were identified as relevant: knowledge (there is insufficient evidence to guide intraoperative transfusion); social/professional role and identity (surgeons and anesthesiologists share responsibility for intraoperative transfusion decisions); beliefs about consequences (concerns about both the morbidity associated with transfusion and of anemia when choosing not to transfuse); environmental context/resources (the type of surgery, availability of point-of-care hemoglobin devices, postoperative level of monitoring, concerns about local blood supply, and the cost of transfusion influencing transfusion decisions); social influences (institutional culture, judgment by peers, relationship with the surgeon or anesthesiologist, and patient preference influencing transfusion decisions); and behavioural regulation (wanting better intraoperative guidelines to guide intraoperative transfusion, the usefulness of individual audits and educational sessions to guide intraoperative transfusion). **Conclusion:** This study identified a range of beliefs underlying intraoperative RBC transfusion decision-making and explained part of the observed inter-clinician variability in behaviour. Targeted theory-informed behaviour-change interventions can be derived from this work to reduce intraoperative transfusion variability.

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Effectiveness of preoperative oscillating positive expiratory pressure (OPEP) therapy in reduction of postoperative respiratory morbidity in patients undergoing surgery: a systematic review. ***Jeff Metz, Reza Naqvi, Ruediger Noppens, Jeff Hawel, Ahmad Elnahas, Christopher Schlachta, Nawar Alkhamesi.*** **From Western University.**

Background: Postoperative pulmonary complications (PPCs) are common following surgery. Preoperative pulmonary physiotherapy can decrease the risk of PPCs. Oscillating positive expiratory pressure (OPEP) is a novel respiratory therapy that uses positive pressure and oscillatory vibrations to exercise pulmonary muscles and promote mucus clearance. Evidence is lacking regarding the use of OPEP devices in the preoperative setting to reduce PPCs. **Methods:** We conducted a systematic review to identify all available literature regarding the usage of OPEP or similar respiratory modalities in the preoperative setting for reducing PPCs. We conducted a literature search within CINAHL Complete, Cochrane Central Register of Controlled Trials, Ovid AMED, Ovid Embase Classic+Embase, Ovid MEDLINE, and PubMed. Title, background, and full-text screening were performed independently by 2 investigators. We included studies that were trial based, involved a comparison of therapeutic interventions, and where patients received OPEP therapy, or a similar device-based respiratory therapy, preoperatively. Included studies examined the effect of the intervention on the incidence of PPCs. We excluded studies that were not trial based, used postoperative or intraoperative interventions, and all other studies using respiratory therapies unrelated to OPEP. **Results:** We identified 598 studies; 43 were selected for detailed evaluation, and 4 met our inclusion criteria. Only 1 study used an OPEP device in the preoperative setting, which demonstrated a reduction in PPCs from 20.5% to 2.9%. The remaining studies used respiratory therapy modalities such as intermittent positive pressure breathing, bottle blowing, and inspiratory muscle training, without demonstrating a reduction in PPCs. **Conclusion:** This systematic review demonstrates a paucity of data regarding the potential impact of OPEP therapy in the preoperative setting for PPC reduction. Most studies identified in the literature were performed in the postoperative setting. Only 1 study used an OPEP device exclusively in the preoperative setting. Further trials are needed to address this knowledge gap.

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Accuracy of point-of-care testing devices for hemoglobin in the operating room: a systematic review and meta-analysis. ***Hilalion (San) Ahn, Tori Lenet, Richard Gilbert, Ranjeeta Mallick, Julie Shaw, Daniel McIsaac, Guillaume Martel.*** **From University of Ottawa (Ahn, Lenet, Gilbert, Shaw, McIsaac, Martel) and The Ottawa Hospital Research Institute (Mallick).**

Background: Point-of-care testing for hemoglobin (POCT-Hb) is increasingly used in the operating room to guide transfusions. The accuracy of POCT-Hb in surgery is, however, unclear, and inaccurate devices could lead to inappropriate transfusions. A systematic review and meta-analysis of method comparison studies assessing the accuracy of POCT-Hb versus central laboratory in patients undergoing surgery was performed. Embase, Ovid MEDLINE, and EBM Reviews were searched from inception to April 2020. **Methods:** Studies that compared hemoglobin measurements between POCT-Hb devices and central laboratory in patients undergoing any surgery in the operating room were included. The primary outcome was the mean difference (MD) between POCT-Hb and central laboratory (with standard deviation [SD]). Using a random-effects model, the population limits of agreement (95% LOA) were calculated as a function of the average difference between the 2 tests, the average within-study variation, and variation in bias across studies. **Results:** The allowable reference standard for hemoglobin measurement defined by the Institute of Quality Management in Healthcare (IQMH) is 4.0 g/L. Of 2377 identified studies, 32 were included (n = 2591 patients, 8476 hemoglobin paired measurements). Several devices were compared with central laboratory (pulse co-oximetry: 24 studies; HemoCue: 9 studies; iSTAT: 6 studies; blood gas analyzers: 9 studies; and hematology analyzer: 1 study). The median sample size was 40 paired measurements, 10 of 32 studies had manufacturer funding, and 15 of 32 studies were low risk of bias. The pooled MD (95% LOA) was 2.5 g/L (–28.2 to 33.1) for pulse co-oximeters, –0.6 g/L (–10.6 to 9.3) for HemoCue, –0.3 g/L (–8.4 to 7.8) for iSTAT, and –2.0 g/L (–16.5 to 12.5) for blood gas analyzers. The pooled intervals for POCT-Hb devices were all larger than the allowable reference defined by IQMH. **Conclusion:** Hemoglobin values measured by POCT devices cannot be considered interchangeable with central laboratory, and abundant caution is necessary when using these devices to guide transfusions in the operative setting.

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Opioid-free analgesia after outpatient general surgery: a qualitative study focused on the perspectives of patients and clinicians involved in a pilot trial. ***Uyen Do, Makena Pook, Tahereh Najafi, Fateme Rajabiyazdi, Charbel El-Kefraoui, Saba Balvardi, Natasha Barone, Hiba Elhaj, Philip Nguyen-Powanda, Lawrence Lee, Gabriele Baldini, Liane Feldman, Julio Fiore Jr.*** **From McGill University (Do, Pook, El-Kefraoui, Barone, Nguyen-Powanda, Fiore), Iran University of Medical Sciences (Najafi), Carleton University (Rajabiyazdi), and the McGill University Health Centre (Balvardi, Elhaj, Lee, Baldini, Feldman).**

Background: Opioid-free analgesia (OFA) may mitigate opioid-related harms after outpatient general surgery; however, the comparative effectiveness of this approach should be assessed in robust randomized controlled trials (RCTs). Undertaking an RCT on OFA raises important practical concerns, including surgeon and patient hesitation regarding pain management without opioids. **Methods:** We conducted a qualitative study to explore patients' and clinicians' perspectives and experiences with a pilot trial focused on OFA after outpatient general surgery. Patients undergoing

outpatient abdominal and breast procedures were randomized to receive post-discharge opioid analgesia (OA) or OFA. Semistructured interviews with patients and clinicians involved in the trial were conducted to elicit personal perspectives and experiences. Purposive sampling for maximum variation was used to recruit participants with diverse characteristics. Transcribed interviews were assessed using inductive thematic analysis. **Results:** Ten patients (5 abdominal, 5 breast) and 10 clinicians (6 surgeons, 2 anesthesiologists, 2 nurses) were interviewed. Five major themes emerged: readiness for trial engagement, pre-trial thoughts about the interventions, postoperative pain experiences, intervention acceptability, and trial refinement. Most patients were open to OFA. Clinicians expressed willingness to prescribe OFA, particularly after less invasive procedures and when using peripheral nerve blocks (PNBs). Concerns were raised regarding the adequacy of pain control and adverse effects of nonopioid drugs (e.g., nonsteroidal anti-inflammatory drug–induced bleeding, kidney injury). Overall, participants were enthusiastic about the trial and recognized its relevance; clinicians praised the study design and organization, and patients valued the use of electronic questionnaires. **Conclusion:** Suggestions for improvements included preventing potential bias arising from the use of PNBs (i.e., via standardization or stratification) and reducing patient burden (i.e., decreasing postoperative questionnaires). Our findings support that patients and clinicians generally accept the clinical equipoise between OA and OFA after outpatient general surgery and recognize the need for methodologically robust trials to inform evidence-based analgesia prescribing.

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The impact of the COVID-19 pandemic on general surgery residency: an analysis of operative volumes by residents at a Canadian general surgery residency program. ***Armin Roubi, Kieran Purich, Uzair Jogiat, Deng Mapiour, Michael Kim*. From University of Alberta.**

Background: The COVID-19 pandemic has caused disruptions to surgical training across the world. The majority of the existing research on this topic has been based on qualitative methods. The purpose of this study was to quantify the impact of the pandemic on the operating volume of residents at a single Canadian general surgery program. **Methods:** The T-Res assessment system (Resilience Software Inc.) is used by many surgical residents to log procedures. Anonymized data for a Canadian program was obtained for the months of July 2019–November 2020. The 8 months before the pandemic (July 2019–February 2020) were compared with the 8 months following the onset of the pandemic (April 2020–November 2020). Residents on research or personal leaves were excluded. To further assess the impact of the first COVID-19 wave, a record of all operative cases was obtained from one of the local major hospitals. **Results:** We analyzed 7986 cases logged by 18 residents across all postgraduate years (PGY). There was a slight, nonsignificant increase in average number of cases per resident in the pandemic period compared with the pre-pandemic period (208.2 v. 235.5; $p = 0.33$). Data from the hospital records showed a 23% reduction in cases during the analyzed timeframe. However, general surgery was affected less than other specialties, with a 10% reduction. **Conclusion:** The analyzed general surgery program did not see a reduction in resident operative volumes. Possible explanations include the overall large volume of emergency cases at this program, and the lower impact of the pandemic on general surgery compared with other specialties. We acknowledge the limitation that heterogeneity exists within hospital protocols, opportunities obtained on different rotations and resident logging practices. Further quantitative research on the topic, stratified by PGY status is needed.

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Postoperative care protocols for elderly emergency surgical patients: a quality improvement initiative. ***Brianna Greenberg, Ashlie Nadler*. From University of Toronto (Greenberg, Nadler) and Sunnybrook Health Sciences Centre (Nadler).**

Background: As our geriatric population continues to grow, health care professionals are finding it necessary to address the specific physiologic, functional and cognitive demands of older patients after emergency general surgery (EGS) to improve their outcomes. **Methods:** We conducted a systematic review to identify protocols in the literature that have been designed to improve the disposition, length of stay, and overall health outcomes of this expanding patient population. Embase, Cochrane and Medline databases were searched to identify all studies published on interventions to reduce delirium, improve or maintain preoperative functional status, and reduce length of stay that were used postoperatively for elderly patients undergoing emergency or acute surgery. Keywords included "geriatric," "frail," "elderly," "postoperative care," "emergency operation," "acute care operation," "guideline," "recommendation" and "quality improvement." Patients younger than 65 years and nonemergency surgeries were excluded. Six studies were identified from the literature search that met our inclusion criteria. These were all before-and-after studies, and 100% involved a multidisciplinary approach from a panel of experts in physiotherapy, social work, occupational therapy, and nursing. **Results:** Specific interventions include early involvement of a geriatrician team or hospitalist (100%), targeted geriatric-led ward rounds (1/6), unique postoperative order sets (1/6), and volunteer-driven mentally stimulating activities (1/6). Standard care, including early removal of lines, early mobility, optimized hydration and medication review, was also pertinent. These interventions were associated with decreased length of stay (5–9 d to 4–6 d), decreased postoperative complications (relative risk 0.24) and increased likelihood of disposition to home (50% to 70%). **Conclusion:** Two studies specifically addressed frailty of these patients, which correlated with worst outcomes. Although the evidence is limited, a successful postoperative protocol for elderly EGS patients involves a targeted, multidisciplinary approach, early involvement of geriatrics or hospitalists, and standardized postoperative order sets. This information will help guide future quality improvement initiatives locally.

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Adverse events following robotic compared to laparoscopic and open surgery: a population-based analysis. ***Hala Muaddi*, *Theres Stukel*, *Charles De Mestral*, *Avery Nathens*, *Stephen Pautler*, *Bobby Shayegan*, *Wael Hanna*, *Christopher Schlachta*, *Rodney Breau*, *Laura Hopkins*, *Timothy Jackson*, *Paul Karanicolas*. From University of Toronto (Muaddi, De Mestral, Nathens, Jackson, Karanicolas), ICES (Stukel), Western University (Pautler, Schlachta), McMaster University (Shayegan, Hanna), University of Ottawa (Breau), and University of Saskatchewan (Hopkins).**

Background: Robotic surgery was integrated into health care systems with few well-designed studies demonstrating safety or benefit in patient-important outcomes. The study objective was to determine the safety of robotic compared with open and laparoscopic/thoracoscopic approaches by examining 90-day adverse events in 4 commonly performed robotic procedures: radical prostatectomy, total hysterectomy, thoracic lobectomy, and partial nephrectomy. **Methods:** This was a population-based retrospective cohort study of all adults who underwent radical prostatectomy, total hysterectomy, thoracic lobectomy, and partial nephrectomy between 2008 and 2018 in Ontario, Canada. The primary outcome was 90-day total adverse events of robotic compared with open, and laparoscopic/thoracoscopic approaches using propensity score overlap weights. Secondary outcomes included major and minor 90-day adverse events. **Results:** The cohorts included 24741 patients undergoing radical prostatectomy, 75473 total hysterectomy, 18252 thoracic lobectomy, and 4608 partial nephrectomy. Of those, 7637 (6.2%) patients underwent robotic procedures: 5416 (21.9%) radical prostatectomy, 1247 (1.7%) total hysterectomy, 525 (2.9%) thoracic lobectomy, and 449 (9.7%) partial nephrectomy. Using propensity score overlap weights, the absolute risk reduction (aRR) of total adverse events of robotic compared with open surgery were 0.80 (95% confidence interval [CI] 0.74–0.87) for radical prostatectomy, 0.44 (95% CI 0.37–0.52) for total hysterectomy, 0.53 (95% CI 0.44–0.65) for thoracic lobectomy, and 0.72 (0.54–0.97) for partial nephrectomy. Compared with laparoscopic or thoracoscopic approach, the aRR of adverse events of robotic surgery were 0.94 (95% CI 0.77–1.15), 1.00 (95% CI 0.82–1.23), 1.01 (95% CI 0.84–1.21) and 1.23 (0.95% CI 0.82–1.84), respectively. **Conclusion:** After adjusting for patient- and system-level variables associated with robotic surgery, the robotic approach was associated with fewer adverse events than the open approach, while there were no differences between the robotic and laparoscopic/thoracoscopic approaches. This demonstrates that robotic surgery appears to be safe. Its benefit is related to the minimally invasive approach rather than a specific characteristic or quality of the robotic platform.

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Is accrual higher for patients randomized to pragmatic v. exploratory randomized clinical trials? A systematic review and meta-analysis. ***Lily Park*, *Christopher Griffiths*, *Sam Ali*, *Victoria Archer*, *Zacharie Cloutier*, *Dexter Choi*, *Tyler McKechnie*, *Pablo Serrano*. From McMaster University (Park, Griffiths, Ali, Archer, Cloutier, McKechnie, Serrano) and University of British Columbia (Choi).**

Background: Recruiting and retaining patients is challenging, particularly in surgical trials. All trials fall within a spectrum from pragmatic to explanatory designs, where an intervention is assessed in generalizable and stringent settings, respectively. We sought to compare the effect of pragmatic versus explanatory design on patient accrual (percentage of eligible patients enrolled) and attrition rates (enrolled patients present at follow-up). **Methods:** Electronic databases were searched from January 2016 to 2020. Randomized controlled trials (RCTs) involving surgical interventions for gastrointestinal or hepatobiliary pathologies were included. The Pragmatic Explanatory Continuum Indicator Summary 2 (PRECIS-2) was used. The PRECIS-2 scores of all included studies were averaged, defining pragmatic and explanatory trials as studies with scores 1 standard deviation above and below the mean, respectively. Inverse variance method was used to calculate weighted proportions and 95% confidence intervals (CIs). Multiple linear regression was used to assess the effect of PRECIS-2 domains on accrual rates. **Results:** We included 129 RCTs for PRECIS-2 scoring. A score ≤ 27 was explanatory and ≥ 34 pragmatic. We identified 23 explanatory and 14 pragmatic trials for data analysis. The pooled accrual rates were 78% in explanatory (95% CI 0.46–1.00) and 83% in pragmatic studies (95% CI 0.75–0.91). The pooled attrition rate was 91% in explanatory (95% CI 0.89–0.93) and 90% in pragmatic trials (95% CI 0.86–0.94). Although the overall regression of the PRECIS-2 domains were not statistically significant (R^2 = 0.204, $F_{8,14}$ = 1.705, p = 0.18), explanatory recruitment paths (more targeted recruitment efforts) (β = –0.39, t = –1.93, p = 0.07) and pragmatic primary outcomes (research end points more relevant to patients) (β = 0.13, t = 2.12, p = 0.05) trended toward higher accrual rates. **Conclusion:** There is a trend toward improved accrual in pragmatic studies and those with explanatory recruitment paths and pragmatic primary outcomes. There is no difference in attrition rates between pragmatic and explanatory trial designs. This can help inform design decisions for trialists to optimize accrual rates.

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Effect of preoperative proton-pump inhibitor use on postoperative infectious and renal complications after elective general surgery. ***Kelly Vogt*, *J. Andrew McClure*, *Philip Jones*, *Marko Mrkobrada*, *Suzanne Flier*, *Blayne Welk*, *Luc Dubois*. From London Health Sciences Centre (Vogt, McClure, Jones, Mrkobrada, Flier, Dubois) and St. Joseph's Health Care, London (Welk).**

Background: Chronic use of proton-pump inhibitors (PPIs) has been associated with risk of *Clostridium difficile* colitis (CDC), pneumonia, and acute kidney injury (AKI). PPIs are commonly used in the general surgical population, yet their influence in the perioperative period remains unknown. The objective of this study was to investigate the association between preoperative PPI use and the risk of postoperative CDC, pneumonia, and AKI following elective general surgery. **Methods:** This population-based matched cohort study used linked administrative databases to identify patients > 65 years of age who underwent major elective general surgery in Ontario between 2010 and 2019. Patients who filled a

PPI prescription within 90 days before surgery were considered PPI users. **Results:** The primary outcome was a composite of CDC, pneumonia, AKI, and death within 90 days of surgery. Secondary outcomes included each component of the primary outcome, and gastrointestinal (GI) bleeding. PPI users were matched 1:1 to nonusers on the basis of age, sex, procedure, year, and a propensity score predicting PPI exposure. Logistic regression was used to evaluate between-group differences. A total of 74 160 patients were identified, 30.9% (n = 22 906) of whom were PPI users. Of these, 19 294 (84.2%) were successfully matched to 19 294 PPI nonusers to form the study cohort. No meaningful between-group differences in baseline variables were observed. Risk of the primary outcome was similar between PPI users and nonusers (odds ratio [OR] 1.03, 95% confidence interval [CI] 0.98–1.08; p = 0.192). Analysis of secondary outcomes demonstrated PPI exposure to be significantly associated with risk of postoperative pneumonia (OR 1.08, 95% CI 1.040–1.16; p = 0.042) but not CDC, AKI, mortality, or GI bleeding. **Conclusion:** Exposure to PPIs before elective general surgery is associated with a small but significant increase in risk of postoperative pneumonia. Based on risk–benefit assessment, it may be advisable for some patients to discontinue PPIs before surgery, although further study is needed to guide decision-making.

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The early burden of COVID-19 in emergency general surgery care across Canada. ***Nori Bradley*****,** ***Kosar Khwaja*****,** ***Laura Allen*****,** ***Lily Tung*****,** ***Morad Hameed*****,** ***Karina Spoyalo*****,** ***Jacinthe Lampron*****,** ***Carlos Garcia-Ochoa*****,** ***Atif Jastaniah*****,** ***Paul Engels*****,** ***Gaurav Talwar*****,** ***Zacharie Cloutier*****,** ***Sam Minor*****,** ***Brad Moffat*****,** ***Neil Parry*****,** ***Kelly Vogt*****. From Alberta Health Services (Bradley), McGill University (Khwaja, Jastaniah), London Health Sciences Centre (Allen, Moffat, Parry, Vogt), Vancouver General Hospital (Tung, Hameed, Spoyalo), The Ottawa Hospital (Lampron, Garcia-Ochoa), Hamilton Health Sciences Centre (Engels, Talwar, Cloutier), and Nova Scotia Health Authority (Minor).**

Background: At the outset of the global COVID-19 pandemic, care required in the emergency general surgery (EGS) population was uncertain. Early recommendations advised alternate management strategies for EGS conditions in patients who were COVID-19-positive. **Methods:** We conducted a multicentre prospective cohort study to describe the burden of COVID-19 in EGS patients in the initial 2 waves of the pandemic. This prospective cohort study evaluated all adult patients with presumed (before routine testing) or confirmed COVID-19 admitted to acute care surgery (ACS) services with EGS diagnoses in participating centres from Mar. 1, 2020, to Feb. 28, 2021. Data collected included demographics, diagnoses, management approaches and outcomes. Descriptive analyses were completed. **Results:** A total of 6 centres contributed data from 4 provinces. Data represent 591 cases of patients with confirmed (74%) or suspected COVID-19 admitted with EGS diagnoses. The most common EGS diagnoses were appendicitis (23.9%), cholecystitis (22.3%), and small bowel obstruction (18.6%). Nearly 40% of cases suggested a delayed presentation to hospital following symptom onset. An alternate management strategy was used owing to COVID-19 in 22 cases (3.7%). A total of 340 (57.5%) patients underwent operative intervention, and in 226 (38.2%) this was after a failed trial of nonoperative management. In 71 (20.9%) cases, a delay to the operating room was noted; in less than 10%, this was COVID-related. The overall complication rate was 14.7% The early experience with the global pandemic demonstrated a small number of suspected or confirmed COVID-19 cases in patients presenting with EGS diagnoses in centres across Canada. **Conclusion:** Confusion and/or fear associated with COVID-19 were associated with delays in presentation; however, few deviations from usual care were noted after hospital admission. This analysis provides important data as we continue to navigate the ongoing COVID-19 pandemic.

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Laparoscopic subtotal cholecystectomy for the difficult gallbladder: evolution of technique at a single teaching hospital and retrospective review. ***Shirley Xiaoxuan Deng*****,** ***Tega Ebeye*****,** ***Bree T. Sharma*****,** ***Anas Samman*****,** ***Amna Zulfiqar*****,** ***Roderick H. Purzner*****,** ***Brittany Greene*****,** ***Melanie Tsang*****,** ***Shiva Jayaraman*****. From University of Toronto (Deng, Ebeye, Sharma, Samman, Zulfiqar, Greene, Tsang, Jayaraman) and Nanaimo Regional General Hospital (Purzner).**

Background: Laparoscopic subtotal cholecystectomy (LSC) can be performed in lieu of laparoscopic cholecystectomy (LC) when the cystohepatic triangle is too hostile for safe dissection. The purpose of the study was to compare postoperative outcomes between LC and LSC for severe cholecystitis. **Methods:** We conducted a retrospective review of patients with severe cholecystitis who underwent LC or LSC between May 2016 and July 2021 at St. Joseph's Health Centre, Toronto. We stratified LSC cases on the basis of subtype, namely fenestrating and reconstituting, as well as examined the course of all LSC patients who received postoperative endoscopic retrograde cholangiopancreatography (ERCP). Dichotomous variables were analyzed using the Pearson χ^2 test and continuous variables were first analyzed using the Shapiro–Wilk test, which confirmed the presence of non-normality; the nonparametric Wilcoxon rank-sum test was then used. **Results:** Our study included 105 patients who underwent LC and 31 who underwent LSC (22.8% v. 30.4% between 2010 and 2016), of whom 24 (77.4%) were fenestrating subtype. There were no bile duct injuries detected in either group. Slightly longer lengths of stay (average 4 d v. 3 d, p = 0.006) and bile leaks (relative risk [RR] 27.1, 95% confidence interval [CI] 3.5–208.4) were more common in the LSC group. Expectantly, postoperative ERCP (RR 5.9, 95% Cl 1.9–18.9) and biliary stent insertion (RR 20.3, 95% CI 2.5–162.5) were also more common in the LSC group. **Conclusion:** Compared with the period 2010–2016, we are performing fewer LSCs and more LCs for severe cholecystitis. Following our algorithmic approach to safe cholecystectomy has helped to prevent bile duct injury. LC remains the gold standard for management of cholecystitis; however, in extreme cases, LSC is a safe bailout strategy with manageable morbidity.

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The demand for emergency general surgery in Canada: a public health crisis. ***Patrick Murphy*, *Laura Allen*, *Chad G. Ball*, *Morad Hameed*, *Paul Engels*, *Rahima Nenshi*, *Sandy Widder*, *Sam Minor*, *Neil Parry*, *Nori Bradley*, *Brad Moffat*, *Kelly Vogt*. From Medical College of Wisconsin (Murphy), London Health Sciences Centre (Allen, Parry, Moffat, Vogt), Alberta Health Services (Ball, Widder, Bradley), Vancouver General Hospital (Hameed), Hamilton Health Sciences Centre (Engels, Nenshi), and Nova Scotia Health Authority (Minor).**

Background: Emergency general surgery (EGS) represents a significant proportion of general surgical care provided in Canada. However, a comprehensive understanding of the national burden of EGS is lacking. The aim of this study was to describe the volume of EGS care in Canadian hospitals, as well as provincial variation in epidemiology and outcomes. **Methods:** This population-based cohort study used data obtained from the Canadian Institute for Health Information (CIHI) to identify adult patients admitted to hospital emergently for GS diagnoses from 2015 to 2020 in all provinces and territories except Quebec. Diagnoses were identified from a predefined list of *International Statistical Classification of Diseases and Related Health Problems*, *10th Revision*, *Canada* codes, and were classified as hepatopancreaticobiliary (HPB), upper gastrointestinal (UGI), colorectal, hernia, skin/soft tissue, vascular, general abdominal, and other. Data were obtained on demographics, procedures, comorbidities, complications and mortality. Average annual incidence rate for all conditions was calculated and compared among provinces/territories. Descriptive analyses were completed. **Results:** From 2015 to 2020, there were 1 199 045 patients identified, the majority of whom (64%) were treated in community-based centres. The average annual incidence rate was 873 cases per 100 000, representing approximately 11% of all annual hospital admissions across the country. Variability was seen among provinces (range 809–1216/100 000). The most common diagnoses in the cohort were HPB conditions (26%), followed by UGI (24%), and colorectal (15%). There was less regional variation, with HPB conditions predominating across all jurisdictions except all 3 territories where UGI was most common. Overall mortality for the study period was 2.4%, with variation among provinces (range 0.8%–3.1%). Major complications occurred in 3.2% of patients, again with significant provincial variation (range 1.6%–4.6%). **Conclusion:** The burden of EGS disease in Canada is substantial. Heterogeneity in disease presentation, severity and patient outcomes requires a systems approach to identify the ideal structural factors, processes of care, and patient partnerships to optimize outcomes for this diverse population.

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Attitudes of Canadian general surgery staff and residents toward point-of-care ultrasound. ***Mostafa Alhabboubi*, *Sender Liberman*, *Evan Wong*, *Talat Chughtai*, *Joel Turner*. From Jeddah University (Alhabboubi), McGill University (Alhabboubi, Liberman, Wong, Turner), and Hamad Hospital, Qatar (Chughtai).**

Background: Point-of-care ultrasound (PoCUS) has been implemented in many specialties' teaching curricula. However, it is yet to be widely embraced in general surgery (GS). This survey aims to identify the attitude of the GS Canadian academic community toward PoCUS. **Methods:** A multiple-choice online survey was sent to all the 16 Canadian GS programs through the offices of program directors (June–August 2021). The survey comprised 3 sections: participant information, current perceived knowledge of PoCUS, and barriers to PoCUS implementation in training programs and clinical practice. **Results:** The targeted sample included 609 surgeons and 593 residents (total 1202). Of those, 58 surgeons and 79 residents responded to the survey, (11.3% response rate). Overall, only 5.2% reported using PoCUS daily and 44.8% of staff surgeons reported having never used PoCUS. The most common reported indications included extended Focused Assessment with Sonography in Trauma (eFAST) and insertion of central lines. Only 8.6% used PoCUS to assess for cholelithiasis. Staff surgeons were reluctant to operate based solely on findings of PoCUS. However, compared with residents, attendings were more likely to operate on patients based on PoCUS findings for appendicitis (30 of 58 [51.7%] v. 28 of 79 [35.4%], $p = 0.042$). A majority of residents (69.5%) believed that PoCUS should be implemented in training programs. However, only 21.5% reported having an official PoCUS curriculum. The applications most requested for inclusion in a training program included eFAST, assessment of shock, central line insertion and abscess drainage. The perceived accuracy of PoCUS for various surgical indications (shock, gallstones, cholecystitis, appendicitis, bowel obstruction) was significantly less than what is reported in the literature. The perceived barriers to PoCUS implementation included lack of time for training, lack of confidence in PoCUS, and concerns about medicolegal consequences. **Conclusion:** This study reveals support for PoCUS training by GS residents despite low current usage and reliance on its findings. Addressing barriers to its implementation and knowledge gaps about PoCUS could lead to wider adoption.

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Psychological impact of COVID-19 on Canadian surgical residents. ***Jessica Lie*, *Sam Wiseman*, *Jennifer Li*, *Nicole Mak*. From University of British Columbia (Lie, Wiseman, Mak) and University of California Los Angeles (Li).**

Background: The COVID-19 pandemic has affected health care workers in unprecedented ways. Surgical residents at baseline have higher prevalence of burnout and depression, and now face unique challenges related to the pandemic. This study sought to evaluate the psychological impact of COVID-19 on surgical residents. **Methods:** An online survey was distributed to surgical residents between June 2020 and January 2021. It covered multiple domains: demographics, socioeconomic factors, clinical experience, educational experience, and psychological outcomes. The Mayo Clinic Resident Well-Being Index (RWBI) was used as a validated measure of resident mental health. Analysis was done with logistic regression. **Results:** A total of 31 residents responded to the survey, corresponding to a 36.0% response rate. Respondents were from general surgery ($n = 21$), orthopedic surgery ($n = 5$), otolaryngology ($n = 2$), urology ($n = 2$) and vascular surgery ($n = 1$) training programs. Seventeen

(54.8%) respondents were female, 24 (77.4%) were senior residents and 21 (67.7%) were in a relationship. Residents were concerned about infecting family members (71.0%) and about personal protective equipment (PPE) supply (54.8%). Most residents (64.5%) were satisfied or very satisfied with their operative experience, but only 41.9% were happy with educational activities. Despite measures that were put in place to support the wellness of residents, 57.1% reported feeling burnt out and 46.4% depressed. Residents who were concerned about PPE supply were found to have 6.67 (95% confidence interval [CI] 1.24–35.71, $p = 0.027$) times the odds of depression than those who were not. The median RWBI was 2.5, slightly higher than the United States National Resident Survey median of 2. There were 10.7% of residents who had an at-risk score of 5 or more, compared with the US National 20.25%. **Conclusion:** The pandemic had a considerable impact on the psychological well-being of surgical residents. Continued investigation into mental health risk and protective factors is needed to improve future response of residency programs to unexpected stressors.

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Validation of an artificial intelligence platform for the guidance of safe laparoscopic cholecystectomy. ***Simon Laplante, Babak Namazi, Parmiss Kiani, Daniel Hashimoto, Adnan Alseidi, Mauricio Pasten, L. Michael Brunt, Sujata Gill, Brian Davis, Matthew Bloom, Luise Pernar, Allan Okrainec, Amin Madani.*** **From University of Toronto (Laplante), University of Texas Southwestern Medical Center (Namazi), Ryerson University (Kiani), University Hospitals (Hashimoto), University of California San Francisco (Alseidi), Instituto de gastroenterologia Boliviano Japones (Pasten), Washington University School of Medicine (Brunt), Northeast Georgia Medical Center (Gill), Texas Tech University, Paul L. Foster School of Medicine (Davis), Cedars-Sinai Medical Center Los Angeles (Bloom), Boston Medical Center (Pernar), and University Health Network (Okrainec, Madani).**

Background: The purpose of this study was to evaluate the performance of the artificial intelligence (AI) model GoNoGoNet compared with expert surgeons in the identification of safe and dangerous zones of dissection during laparoscopic cholecystectomy (LC). **Methods:** GoNoGoNet was previously developed and trained to identify the safe (Go) and dangerous (No-Go) zones of dissection during LC. A panel of high-volume surgeons was recruited to perform free-hand annotations on frames of prospectively collected videos of LC to identify the Go and No-Go zones. Expert consensus ("ground truth") on the location of Go and No-Go zones was established using > 50% pixel agreement. Identification of Go and No-Go zones by GoNoGoNet was compared with expert-derived ground truth using mean F1 Dice Score (validated spatial overlap index), pixel accuracy, sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV). **Results:** A total of 47 frames from 25 LC videos, procured from 3 countries and 9 surgeons, were annotated simultaneously by an expert panel of 6 surgeons and GoNoGoNet. Mean (± standard deviation [SD]) F1 Dice scores were 0.58 (±0.22) and 0.80 (±0.12) for Go and No-Go zones, respectively. Mean (± SD) accuracy, sensitivity, specificity, PPV and NPV for the Go zones were 0.92 (±0.05), 0.52 (±0.24), 0.97 (±0.03), 0.70 (±0.21), and 0.94 (±0.04), respectively. For No-Go zones, these metrics were 0.92 (±0.05), 0.80 (±0.17), 0.95 (±0.04), 0.84 (±0.13) and 0.95 (±0.05), respectively. **Conclusion:** AI can be used to identify safe and dangerous zones of dissection within the surgical field, with high specificity and PPV for Go zones and high sensitivity and NPV for No-Go zones. Overall, model prediction was better for No-Go zones than Go zones. This technology may eventually be used to provide real-time guidance and minimize the risk of adverse events.

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Predictors of recurrent appendicitis after nonoperative management: a prospective cohort study. ***Jessica Lie, Trevor Hamilton, Kylie Nabata, Jenny W. Zhang, Darren Zhao, Phil Dawe, Morad Hameed.*** **From University of British Columbia.**

Background: Appendectomy has been the standard of care for treatment of appendicitis for decades. Nonoperative management (NOM) of appendicitis is an alternative treatment strategy and had a resurgence of interest owing to the COVID-19 pandemic and the need for alternate care delivery models. One of the concerns for treatment of appendicitis with NOM is the recurrence rate. Despite this, there are few data examining the predictors of recurrence to tailor patient selection for NOM of appendicitis. The objective of this study was to identify predictors for recurrent appendicitis in patients with appendicitis previously treated nonoperatively. **Methods:** We conducted a prospective cohort study of all adult patients with appendicitis treated at a tertiary care hospital between May 1, 2019, and Apr. 30, 2021. Patients with appendicitis who were treated nonoperatively were identified. Patient demographics, radiographic information, management, and clinical outcomes were recorded. **Results:** The primary outcome was recurrent appendicitis within 6 months after discharge from the index admission. Given the competing risk of interval appendectomy, a univariate and multivariate time-to-event competing-risk analysis was performed with Cox regression. Of the 74 patients, 35 (47.3%) were women (median age 48 [interquartile range (IQR) 33–64] yr) with appendicitis treated successfully nonoperatively, 21 patients (29.2%) had recurrent appendicitis and 20 (27.8%) underwent an interval appendectomy. Median time to recurrence was 17 days (IQR 7–66). Presence of an appendicolith on imaging was associated with a higher cause-specific hazard of recurrent appendicitis. Age, sex and history of diabetes were not found to be associated with recurrence of appendicitis. The adjusted cause-specific hazard ratio of recurrent appendicitis for presence of appendicolith was 2.67 (95% confidence interval 1.09–6.56, $p = 0.032$). **Conclusion:** Our study found that presence of appendicolith was associated with a 2.67 increase in cause-specific hazard of developing recurrent appendicitis within 6 months. This information can help tailor patient selection for nonoperative management.

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The effect of the first wave of the COVID-19 pandemic on colorectal and hepatobiliary oncologic outcomes at a tertiary care centre. ***Jeremy Drung, Laura Allen, Ken Leslie, Jeremy Drung.*** **From Western University.**

Background: There are well-established guidelines surrounding target wait times for patients diagnosed with cancer. Wait 1 is the time from referral to a patient's first surgical oncology appointment. Wait 2 is the time from the decision to operate to the actual operation. During the first wave of COVID-19 in March 2020, elective operations decreased and the majority of in-person appointments were cancelled or changed to telephone appointments. Oncologic operations were allowed to continue; however, routine screening temporarily stopped. Previous data have shown that during the first wave of the pandemic, the percentage of patients meeting the target time for Wait 2 significantly decreased. This translates to longer wait times for oncologic operations overall. The objective of this study was to determine the effect that the COVID-19 pandemic has had on postoperative and oncologic outcomes in patients who underwent surgery for colorectal or hepatobiliary malignancy during the first wave of the pandemic. **Methods:** Outcomes from all patients who underwent oncologic colorectal or hepatobiliary surgery from Mar. 15, to June 30, 2020, were compared with the same time period in 2019. **Results:** In patients who underwent either colorectal or hepatobiliary surgery, there was no significant difference in readmission rates, postoperative emergency department visits, or length of stay between 2019 and 2020. In patients who underwent hepatobiliary (HPB) surgery there was no significant difference in tumour stage ($p = 0.122$), margin status ($p = 0.157$), postoperative complications ($p = 0.328$) or 30-day mortality ($p = 0.977$) from 2019 to 2020. There was a significantly higher 1-year mortality in 2020 (29.2%) than 2019 (4%) ($p = 0.017$). **Conclusion:** Our study shows that the effect of the COVID-19 pandemic was not associated with increased immediate complications or higher stage of malignancy at the time of operation; however, it was associated with a significantly higher mortality at 1 year for patients who underwent HPB oncologic surgery.

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Trends in training and workforce representation for Canadian general surgeons working in critical care: a descriptive study. ***Thomas Nixon*****,** ***Kieran Purich*****,** ***Kevin Verhoeff*****,** ***Samuel Skinner*****,** ***Raveena Dhaliwal*****,** ***Matt Strickland*****. From the University of Alberta.**

Background: A strength of critical care (CC) delivery in Canada has been the breadth of subspecialty representation among intensivists. We aimed to characterize the number of general surgeons working in CC, their training, and trends over time to evaluate current general surgery representation and inform future CC surgeon training. **Methods:** We performed an observational study evaluating Canadian general surgeons practising CC in January 2022. Data were obtained through medical registration and institutional websites and included the year and location of medical degree (MD) completion, the country of fellowship training and the presence of graduate degree training. **Results:** We identified 86 surgeons across 9 provinces. Eighty-four (97.7%) completed their MD degree in Canada. Eighty-one (94.2%) had formal CC fellowship training, with 61 (75.3%) fellowships being completed in Canada. Thirty-eight surgeons (44.2%) had a graduate degree. Looking at trends, it appears that from 1980 to 2011 there was a trend toward Canadian CC fellowship training for general surgeons. There is also a steady increase in the number of general surgeons practising CC who hold graduate degrees, progressing from 25% of the surgeons who obtained their MD degree in 1981–1990 to 66.7% of the surgeons who obtained their MD degree in 2010–2021. Additionally, there were 23 trauma surgeons identified who had fellowship training in CC but were practising without a CC component. It is possible that CC training is being pursued for experience in managing critically ill patients, or that it was undertaken in a combined CC and trauma fellowship without the intention of practising as an intensivist. **Conclusion:** We identify trends seen within the general surgery representation in the Canadian CC environment. It is important for fellowship programs to be aware of these trends to ensure appropriate hiring opportunities for future trainees and to maintain current surgical representation within CC teams.

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White presentation: teaching safe opioid prescription and opioid use disorder management in Canadian universities. ***Alexandra Allard-Coutu*****,** ***Barbara Heller*****,** ***Victoria Wright*****,** ***Wanjae Cho*****,** ***Michael Wong*****,** ***Kevin Singh*****. From University of Ottawa (Allard-Coutu), McMaster University (Heller, Cho, Wong), Western University (Wright), and University of Toronto (Singh).**

Background: The ongoing opioid crisis is a major public health concern in Canada. However, addiction medicine is poorly represented in medical school curricula. Moreover, opioid prescription practices and the quality of medical training have been implicated as contributing to the opioid crisis. An evidence-based curriculum on pain management, opioid prescription and substance use disorders must be incorporated into Canadian medical schools. Our work had 3 objectives: teaching safe opioid prescription practices, effective screening of at-risk patients and accurate, comprehensive pain assessments to medical students; increasing awareness of available resources, including pain management centres, and conveying an understanding of interprofessional care for the management of pain to develop patient-centred multimodal pain management strategies; and depicting pain in a population health context to emphasize social, cultural, economic and psychological determinants of health. **Methods:** Given the paucity of literature on integrating evidence-based opioid prescription and management of substance use disorders into medical education, this white paper proposes an evidence-based curriculum framework with a 4-step implementation plan to guide the development of improved pain curricula. Step 1 is a review of Canadian medical schools' pain curricula and needs assessment; step 2 is to establish a medical education expert committee, perform a literature review, and develop a standardized curriculum; step 3 is to implement curricula into Canadian medical training programs; and step 4 is evaluation of the impact of the curriculum. We propose the following recommendations. Canadian medical schools should update curricula to include evidence-based content and competency testing to train graduates to manage acute and chronic pain as well as substance use disorders. The Curriculum Governance Committee should develop partnerships with policymakers, funding agencies, and professional associations to build an infrastructure of leaders in addiction education/curriculum innovation as well as undertake curriculum evaluation following

implementation to evaluate content/delivery. Licensing and accreditation bodies should incorporate safe opioid prescription and substance use disorder management principles into medical curriculum standards. **Results:** Pending.

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How bad is really bad, eh? Impact of the first wave of the COVID-19 pandemic on residents' operative volume: the experience of a Canadian general surgery program. ***Sarah Mansouri, Émilie Comeau, Yves Collin, Sonia Cheng Oviedo*. From Université de Sherbrooke.**

Background: The aim of this study was to quantify trainees' operative volume and assess the effect of the first wave of COVID-19 on general surgery residents' training at a Canadian academic centre. An observational study was performed, focusing on objective operative volumes, hands-on experience, and subjective perceived impact of the pandemic by trainees. **Methods:** All residents enrolled in our program were included. Quantitative data were collected from anonymized residents' case logs and annual departmental statistics. Qualitative data on residents' perception of the impact of the pandemic was provided by a resident-led focus group. The period of interest, the first wave of the COVID-19 pandemic (January–June 2020), was compared with a reference period (January–June 2019). Case logs of all 21 residents were reviewed. **Results:** During the first wave of the COVID-19 pandemic, residents logged a total of 475 cases, compared with 914 cases before the pandemic. This represents a decrease of 48% in operative volume; junior residents saw a decrease of 50% and senior residents saw a decrease of 46%. Postgraduate year (PGY)-1 residents were most affected, with a reduction of 58% in operative volume. PGY-4 was the group least affected with a reduction of 37%. When looking at key procedures, junior residents performed 71% fewer laparoscopic appendectomies and 49% fewer laparoscopic cholecystectomies during the pandemic. Senior residents saw a reduction of 55% in lower anterior resections and a reduction of 58% in right hemicolectomies compared with reference period. The resident focus group discussion revealed that 92% of residents think the pandemic had significant drawbacks on their surgical skills and they unanimously reported an overall negative perceived effect on their training. **Conclusion:** The data provided by this study demonstrate how much the pandemic compromised hands-on exposure of all residents. The reduction in operative volume affected all years of training, especially junior years. This raises concern about the short- and long-term effects on trainees' technical skills. The insights brought by this study will help create personalized mitigating measures and guide future curricula to be more resilient in the face of a next sanitary crisis.

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Surgeon-specific encounters within a multidisciplinary care pathway: Is there a role for shared care models in surgery? ***Alex Lee, Luckshi Rajendran, Tyler Lamb, Morgann Reid, Anastasia Turner, Kimberly Bertens, Janelle Rekman, Fady Balaa*. From University of Ottawa (Lee, Lamb, Reid, Turner, Bertens, Rekman, Balaa) and University of Toronto (Rajendran).**

Background: Clinical guidelines (e.g., National Comprehensive Cancer Network [NCCN] and Cancer Care Ontario [CCO]) outline best practice care processes in the diagnosis and management of oncologic patients. Patient navigation through these care processes is dependent upon patient–surgeon encounters, with queues that affect access to care and wait times. Shared care models have the potential to enhance systems efficiency along the care pathway by directing patients to the next available surgeon or surgeon-allocated resource. However, translational experience in understanding how patient navigation can be enhanced in shared care is limited. The objective of this study was to identify and map the various surgeon-related queues and relevant stakeholders encountered during a patient's journey within a shared care model. **Methods:** A preliminary list of surgeon-related queues was created based on a developed case scenario of a patient presenting with rectal cancer and synchronous liver metastases (RCLM) and informed by the care processes involved in the NCCN and CCO guidelines. A team of health care providers with experience in a shared care practice was selected through purposeful sampling to edit the list of queues over a series of 3 group meetings. A preliminary patient encounter map was created and refined using process mapping methodology. **Results:** Twelve surgeon-related queues were initially identified by the research group. A total of 3 surgeons and 3 nurse navigators were selected to provide further edits and comments through group meetings. An additional 3 queues were included to create a process map for a patient with RCLM receiving multidisciplinary oncologic care within a shared care model. **Conclusion:** Timely navigation of care processes for complex gastrointestinal oncologic care is dependent on efficient health system design. The many bottlenecks, or surgeon-related queues, identified in this process map may be improved by a shared care model. Future comparative studies to solo practice models are needed.

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A pan-Canadian analysis of approach to treatment for acute appendicitis. ***Jillian Tweedy, Katerina Neumann, Geoff Porter*. From Dalhousie University.**

Background: Appendectomy for acute appendicitis remains a common surgical procedure, with 7%–9% of Canadians requiring an appendectomy during their life. Conservative management of appendicitis with antibiotics has emerged over the past decade as a safe alternative for uncomplicated appendicitis. As updated pan-Canadian data are lacking, the primary objective of this study was to describe the approach to acute appendicitis in Canada, specifically examining the use of laparoscopic (LA) and open appendectomy (OA) over time and by geographic location, as compared with nonoperative inpatient management. **Methods:** The Canadian Institute for Health Information (CIHI) Discharge Background Database (DAD), which includes the clinical and demographic information on hospital discharges from 9 Canadian provinces (excludes Quebec), was used to identify the study cohort of patients admitted through an emergency department with a primary diagnosis of acute appendicitis between 2004 and 2018. **Results:** Among the study cohort of 438 755 patients, 372 380 (84.9%) underwent appendectomy. Of these, 267 925 (71.9%) underwent LA, while 104 455 (28.1%)

underwent OA. The overall proportion of appendectomy patients undergoing LA rose markedly over the study period, from 35.5% in 2004 to 92.5% in 2018. The increase in LA over the period was seen across all provinces, with the greatest increase in Prince Edward Island (8.0% in 2004 to 78.3% in 2018) and the smallest increase in Saskatchewan (39.7% in 2004 to 89.5% in 2018). Although the primary diagnosis of acute appendicitis has increased, the proportion of patients undergoing nonoperative management of appendicitis compared with surgical management during the index admission was largely unchanged. **Conclusion:** There has been a clear shift toward LA for acute appendicitis over the past 14 years in Canada, although geographic variation in the extent and rate of uptake exists. There does not appear to be an increased use of inpatient nonoperative management of acute appendicitis.

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Appendix neoplasm stratified by age: understanding the best treatment for appendicitis. ***Michael A. D'Elia*****,** ***Iris Teo*****,** ***Catherine L. Forse*****,** ***Reilly Musselman*****. From University of Ottawa (D'Elia), The Ottawa Hospital, Eastern Ontario Regional Laboratory Association (Teo, Forse), The Ottawa Hospital Research Institute (Musselman), and The Ottawa Hospital (Musselman).**

Background: Acute appendicitis represents one of the most common surgical emergencies managed by general surgeons. Historically, treatment has centred on surgical resections, but in recent years there has been increasing interest in nonoperative management (NOM), with relatively good success. Many of these studies focus on quality of life or cost analysis, but indicate high numbers can avoid surgery. Appendix neoplasm make up only about 1% of appendectomy specimens, often presenting as acute appendicitis and identified on final pathology. Underlying neoplasm causing appendicitis has not been discussed with the concept of NOM and could lead to significant consequences. **Methods:** In this study we looked to risk stratify appendix neoplasm by age to help identify patient populations in which an NOM approach may be used versus those where it might be harmful. We examined pathologic appendix specimens analyzed from a variety of procedures over 11 years from 7 hospitals. With these results we were able to identify the underlying pathology of each specimen and stratify them by disease pathology against patient age. **Results:** In total we examined more than 16 000 specimens, identifying more than 750 lesions. From our data we were able to show that the overall rate of appendix lesions increased with age. Individuals older than 55 years had lesions identified in > 8% of total specimens, while those 20 years of age or younger had lesions in < 0.7%, with these almost exclusively being neuroendocrine tumours (NETs). Furthermore, we showed that the mean age of disease varies by pathology, with NET being 44.5 years, while all other pathologies typically being late 50s and early 60s. **Conclusion:** This study highlights that using an NOM approach beyond the pediatric population might be a concern as the rates of underlying pathology increase steadily and could lead to negative outcomes if not resected. Older age groups with rates > 8% could be too high for the appendix to be left in situ.

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Predicting acute cholecystitis on final pathology to prioritize surgical urgency: an evaluation of the Tokyo criteria and development of a novel predictive score. ***Brent Hopkins*****,** ***Lily Grozman*****,** ***Nawaf Alshawan*****,** ***Shannon Fraser*****,** ***Simon Bergman*****,** ***Jean-Sebastien Pelletier*****,** ***Tsafrir Vanounou*****,** ***Evan G. Wong*****. From McGill University.**

Background: The COVID-19 pandemic has compounded limitations in access to the operating room, highlighting the need for improved surgical prioritization rules for common pathologies, including acute cholecystitis. The objective of this study was to compare the performance of our institution's surgical prioritization rules to the Tokyo diagnostic criteria and to develop a novel decision rule to predict acute cholecystitis on surgical pathology. **Methods:** All consecutive adult patients undergoing emergency cholecystectomy at a single academic institution between April 2017 and April 2021 were reviewed. The primary outcome was diagnosis of acute inflammation on final pathologic analysis. Multiple logistic regression was performed with a training subset using relevant clinical variables that were selected a priori. A simple weighted decision rule was created and compared with the Tokyo diagnostic criteria and the institution's existing prioritization rules via an analysis of receiver operating characteristic curves on a second subset of the population. **Results:** Among 756 patients undergoing emergency cholecystectomy, 97.6% met criteria for acute cholecystitis as per Tokyo diagnostic criteria. Tokyo criteria (area under the curve [AUC] 0.51, sensitivity 99%, specificity 3%) poorly discriminated for acute inflammation on final pathology. Discrimination of the hospital's case prioritization rules was moderate (AUC 0.63, sensitivity 48%, specificity 78%), and a new simple decision rule incorporating fever, Murphy sign, leukocytosis and inflammation on imaging was significantly higher (AUC 0.69, sensitivity 72%, specificity 64%, $p < 0.003$). **Conclusion:** In this large cohort of emergency cholecystectomies, the Tokyo diagnostic criteria were highly sensitive but nonspecific for acute cholecystitis on final pathology. An existing institutional case prioritization rule showed moderate discrimination for these outcomes but was outperformed by a novel parsimonious score incorporating readily available preoperative variables. These findings may be useful in the prioritization of emergency cholecystectomies at busy centres but remain to be validated in outside cohorts.

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Obesity is an independent predictor of acute renal failure after surgery. ***Ananya Srivastava*****,** ***Brodie Nolan*****,** ***Lyon Qiao*****,** ***James Jung*****. From University of Toronto (Srivastava, Qiao), St. Michael's Hospital (Nolan), and Codman Center for Clinical Effectiveness in Surgery, Massachusetts General Hospital (Jung).**

Background: It is estimated that one-third of Canadians will have obesity (body mass index [BMI] ≥ 30) by the year 2030. Acute renal failure (ARF) is a severe postoperative complication associated with poor clinical outcomes, such as increased length of hospital stay and death. Obesity has previously been associated with an increased risk of acute kidney injury. However, it

is not known whether obesity is associated with increased risk of postoperative ARF. **Methods:** We determined the relationship between obesity and postoperative ARF within 30 days of an elective general surgery procedure. We performed a cohort study of adult patients in the 2015–2019 National Surgical Quality Improvement Program database who underwent elective general surgery procedures. The primary outcome was ARF within 30 days. The independent variable was BMI categories, including underweight (BMI < 18.5), normal (BMI 18.5–24.9), overweight (BMI 25–29.9), obesity (BMI 30–39.9), severe obesity (BMI 40–49.9), and extreme obesity (BMI ≥ 50). Unadjusted comparisons of patient-level and procedure-level variables were performed for patients with postoperative ARF and those without. Multivariable regression analyses were performed to model the relationship between BMI categories and postoperative ARF after risk adjustment. **Results:** A total of 424 527 patients were included in the analysis and 3638 patients (0.8%) developed ARF. Patients with ARF were older (median age 64 [interquartile range (IQR) 56–71] yr) and had a higher BMI (mean 32.0 [standard deviation (SD) 8.8]) than those without (median age 58 [IQR 48–67] yr; mean BMI 31.5 [SD 9.0]). After risk adjustment, there was a stepwise rise in the odds of ARF with increasing BMI compared with normal BMI (BMI 25–29.9: odds ratio [OR] 1.11, 95% confidence interval [CI] 1.0–1.23; BMI 30–39.9: OR 1.32, 95% CI 1.2–1.46; BMI 40–49.9: OR 1.45, 95% CI 1.27–1.66; BMI ≥ 50: OR 1.78, 95% CI 1.47–2.15). **Conclusion:** We showed that obesity was independently associated with ARF after elective general surgery procedures. Future research should focus on the etiology and pathophysiology for this relationship.

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Validation of a clinical decision-making assessment tool in general surgery. *Kameela Alibhai*, *Isabelle Raîche*, *Heather McDonald*, *Nada Gawad*. From University of Ottawa (Alibhai, Raîche, Gawad) and Western University (McDonald).

Background: Clinical decision-making (CDM), an important skill for learners to develop, is not objectively assessed in medical training. MyOnCall (MOC) Pager is a mobile application where learners answer simulated pages about virtual patients to build their CDM skills. This study aimed to collect validity evidence for use of MOC Pager questions as a potential CDM assessment tool in general surgery. **Methods:** This 3-part study, grounded in Messick's validity framework, collected content, relation to other variables, response process, and consequences validity evidence. In part 1, senior residents, who served as experts, were interviewed to evaluate the content of MOC Pager questions. In part 2, sample pages were piloted with junior residents and medical students and scored against expert panel responses. Medical students' and junior residents' responses were compared using Mann–Whitney *U* tests and individually analyzed. In part 3, general surgery program directors were interviewed regarding what skills the questions were testing and what impacts the tool may have. Interview transcripts were deductively coded. Ten experts provided feedback about the wording and format of the questions and response options, which were modified accordingly. Twenty learners then answered 50 sample pages. **Results:** Response analysis revealed significant differences between medical students and junior resident median [interquartile range] scores (35.0 [2.00] v. 39.5 [3.75], $p = 0.006$) and identified learners who frequently managed pages with higher or lower acuity than did experts. All 7 program directors indicated the questions tested decision-making skills and the responses provided insight into how safely learners managed pages. Program directors specified that learners' responses should guide formative feedback and be shared cautiously to avoid unintentional harm. **Conclusion:** This study provides 4 types of validity evidence to support use of MOC Pager questions as a formative CDM assessment tool in general surgery. This app may potentially help learners practise CDM and enable educators to objectively assess the safety of learners' clinical decisions.

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Moral distress in the provision of palliative care delivery for surgical patients in British Columbia: lessons learned from the perspectives of general surgeons. *Christina Lee*, *Rona Cheifetz*, *Philippa Hawley*. From the University of British Columbia.

Background: Palliative medicine in Canada continues to be limited by system-wide resource and funding constraints precluding its early integration into standard treatments. Specialist palliative care (SPC) services continue to be underutilized among surgical patients, even in regions that exhibit widespread cultural acceptance of SPC. Moral distress in health care is linked with systemic and institutional resource limitations resulting in clinician burnout. The objective of this study was to explore the perceptions about palliative care among BC general surgeons. **Methods:** This report represents part of a larger exploratory study designed to gain an understanding of palliative care delivery from the experiences of BC general surgeons. Participants were recruited through the BC Surgical Society (BCSS) to complete a self-administered, computer-based survey and invited to participate in an optional semistructured interview. Interviews were recorded, deidentified and transcribed. Analyses were conducted via interpretive description in thematic analysis. Codes and emergent themes were identified through iterative discussions and comparisons. **Results:** Forty-one general surgeons completed surveys, and 11 consented to semistructured interviews conducted between November 2020 and April 2021. Three overarching perspectives were identified central to a theme of moral distress: 1) systemic resource limitations delay the delivery of primary palliative care in surgery, 2) caring for patients with life-limiting disease poses emotional and professional exhaustion, and 3) surgeons perceived a poor delineation of responsibilities in integrating primary and SPC into surgical practice. These themes correlated with feelings of distress related to personal uncertainty, discomfort, and of poor access to SPC for surgical patients throughout the province. **Conclusion:** General surgeons acknowledged the need and emerging role of SPC in surgical practice. These perceptions remain focused toward end-of-life and definitively noncurative trajectories as opposed to an integrative approach where outcomes are uncertain. Moral distress is a negative perpetuating phenomenon that forestalls the earlier integration of palliative care in surgical practice.

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Delays in presentation and severity of illness predict adverse surgical outcomes among patients transferred from rural Indigenous communities for acute care surgery. ***Jeongyoon (Jenny) Moon*, *Zachary Rehany*, *Mehrshad Bakhshi*, *Tarek Razek*, *Jeremy Grushka*, *Nathalie Boulanger*, *Larry Watt*, *Alexandra Vivier*, *Greg Clark*, *Paola Fata*, *Dan Deckelbaum*, *Kosar Khwaja*, *Atif Jastaniah*, *Evan Wong*. From McGill University (Moon, Rehany, Bakhshi, Razek, Grushka, Boulanger, Clark, Fata, Deckelbaum, Khwaja, Jastaniah, Wong) and Centre de Santé Tulattavik de l'Ungava (Watt, Vivier).**

Background: Providing acute care surgery (ACS) care to remote regions is highly challenging. Geographical distances and delays in transport can translate to poor surgical outcomes, particularly for acute surgical conditions requiring timely intervention. The main objective of this study was to identify clinical predictors of poor surgical outcomes for patients transferred for operative ACS conditions from remote Indigenous communities to a tertiary care centre. **Methods:** This was a retrospective cohort study conducted at the main tertiary care centre providing ACS care to the region. All adult patients from those communities who were transferred to the tertiary centre and who underwent a surgical intervention for an ACS condition from 2015 to 2020 were included. The main outcome of interest was the occurrence of a postoperative complication, as defined by the Clavien–Dindo classification. **Results:** In total, 177 patients were transferred and underwent a surgical intervention for an ACS pathology during the study period. The mean age was 40.0 ± 16.7 yr, and half (n = 90, 50.8%) were female. The most common ACS pathology was acute cholecystitis (n = 65, 36.7%), followed by acute appendicitis (n = 51, 28.8%) and diverticulitis (n = 14, 7.9%). Forty-six (26.0%) patients suffered a postoperative complication (≥ Grade 1 Clavien–Dindo). Several differences in patient-, disease-, and treatment-related characteristics were identified on univariate analysis comparing patients with complications to those without. On multiple logistic regression, male gender (odds ratio [OR] 2.75, 95% confidence interval [CI] 1.22–6.17), higher Emergency Surgery Score (OR 1.28, 95% CI 1.03–1.59), higher American Society of Anesthesiology score (OR 2.28, 95% CI 1.23–4.24), and longer delays in presentation (OR 1.07, 95% CI 1.01–1.14) were predictive of postoperative complications. **Conclusion:** Delays in presentation and severity of illness on arrival are associated with worse postoperative outcomes following ACS for patients transferred from rural Indigenous communities. Future quality-improvement initiatives will need to focus on community outreach, minimizing transport delays, point-of-care resuscitation and, ultimately, improved access to onsite surgical care.

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Remote video-based suturing education with smartphones (REVISE): a randomized controlled trial. ***Nathan How*, *Kevin Ren*, *Yuan Qiu*, *Karyssa Hamann*. From McMaster University.**

Background: Suturing is a fundamental skill that surgical trainees must master. Owing to the COVID-19 pandemic, medical schools have transitioned from in-person to virtual avenues of teaching. The development and implementation of virtual procedural skill education is crucial, especially with the possibility of long-term restrictions against in-person learning. Prior research has shown that the addition of video-based coaching significantly improved surgical skills in trainees compared with the standard curriculum. Our objective was to examine whether virtual video-based feedback can improve novice medical students' suturing skills. **Methods:** Fifty-four medical student participants with no prior suturing experience were assigned either to an experimental arm and randomized either to receive remote-recorded feedback (RRF) or remote-live feedback (RLF), or a control arm to receive in-person feedback (control). All participants first learned to suture via an online module, then recorded themselves performing a standardized suturing task at home using a smartphone mount. Customized feedback was then provided by a surgical resident. RRF participants received a customized feedback video, RLF participants received live feedback over Zoom, and control participants received feedback in person. After feedback, participants performed and recorded another video of the suturing task. Pre- and post-feedback suturing performances were scored by blinded assessors using the University of Bergen Suturing Skills Assessment Tool. **Results:** Our primary outcome measure was the score difference between pre- and post-feedback videos. Post-feedback scores were not significantly different between groups. Although there is a trend toward the RLF showing greater improvement (32 [–10 to 59.25] v. 25 [–63 to 77]), this is not statistically significant. **Conclusion:** Based on our interim analysis, there is no significant difference between groups in age, pre-feedback scores, post-feedback scores, or score difference. This work establishes the feasibility and utility of remote video-based feedback in surgical skills training.

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Modified Delphi consensus on appropriate use of laboratory investigations in acute care surgery patients. ***Karina Spoyalo*, *Annie Lalande*, *Andrea MacNeill*, *Jason Park*. From the University of British Columbia.**

Background: Unnecessary laboratory tests can cause iatrogenic anemia and prolong hospital stays, while also stretching hospital resources, increasing health care costs, and contributing to global greenhouse gas emissions. Initiatives like Choosing Wisely provide general laboratory testing recommendations; however, there are no specific guidelines for general surgery patients, especially in resource-intense acute settings. **Methods:** In this study, we developed consensus recommendations on appropriate use of laboratory investigations in uncomplicated acute care surgery patients. Surgeons (n = 17) on a high-volume acute care service at a tertiary care centre participated in a 3-round modified Delphi process. Recommendations were developed based on a scoping literature review for 5 surgical conditions: acute appendicitis, acute cholecystitis, choledocholithiasis, gallstone pancreatitis and small bowel obstruction. In the first round, proposed

recommendations and current evidence were presented to participants, who provided feedback. Two subsequent anonymous rounds of consensus were completed, in which participants were asked to indicate "agree" or "disagree" and provide further feedback on each recommendation. Feedback was incorporated into each iteration until we reached ≥ 70% consensus. **Results:** Twelve surgeons (71%) responded in the second round and 10 (59%) in the third round. Six recommendations were approved: 1) limit routine blood work to a maximum of 3 consecutive days; 2) no postoperative blood work for uncomplicated appendectomy patients; 3) no postoperative blood work for uncomplicated cholecystectomy patients; 4) order a single draw of lipase as the primary diagnostic marker of pancreatitis; 5) no routine investigations for choledocholithiasis and gallstone pancreatitis patients after duct clearance when booked for same-admission cholecystectomy; and 6) no routine investigations for adhesive small bowel obstruction patients who are tolerating oral intake. **Conclusion:** We developed consensus recommendations to reduce unnecessary laboratory tests, which we are incorporating into clinical practice on our acute care service. Future research will review the impacts of these recommendations on systems costs and clinical outcomes.

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Impacts of inpatient food at a tertiary care centre on patient satisfaction, nutrition and planetary health. ***Annie Lalande, Stephanie Alexis, Karina Spoyalo, Keiko Patterson, Neha Gadhari, Jiaying Zhao, Andrea MacNeill.*** **From the University of British Columbia.**

Background: Health care systems are strategically situated to mitigate climate change through the practice of planetary health care, and to leverage food as a determinant of health within hospitalized populations. Aligning hospital food systems with national dietary and planetary health diet guidelines would decrease their climate impacts and increase nutritional value, while providing an opportunity to improve the notoriously poor patient satisfaction with hospital food. The latter contributes to poor oral intake and malnutrition in hospital, which is associated with longer hospital stays, higher rates of unplanned readmissions, and increased mortality. Hospital food systems are thus an important point of intervention for both mitigating health care's carbon footprint and improving nutrition-related outcomes of hospitalized patients. **Methods:** To inform the development and implementation of a nutritious low-carbon menu at a tertiary care hospital, where planetary health has been identified as a strategic priority, we carried out an observational study of the current state of patient satisfaction, nutrition, and food-related emissions and waste in a sample population of 100 surgical inpatients. We also examined patient experience and factors impacting food preferences via a hospital-wide survey of all patients admitted over a span of 2 months. **Results:** Patients' overall satisfaction and perception of the food quality with the current menu was significantly below standard in both the observational study (n = 92) and in the survey (n = 217), while perceptions of the service and physical environment were generally positive. Food taste was the main driver of dissatisfaction and waste. Patients were interested in having more choices, culturally relevant meals and fresh options. Significant rates of food waste, up to 60% for some items, were observed, with food waste quantities over 2 months totalling upwards of 565 kg. **Conclusion:** This study supports the notion that food represents an important opportunity to enhance patients' experience, nutrition, and recovery in hospital while mitigating the health care footprint.

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Racial disparities in health outcomes for oncological surgery in Canada. ***Zarrukh Baig, Rubia Ahmed, Ameer Farooq, Ahmer Karimuddin.*** **From University of Saskatchewan (Baig, Ahmed) and University of British Columbia (Farooq, Karimuddin).**

Background: Health disparities exist in Canada for patients with racialized backgrounds. Prior work has shown that racial minorities often present at more advanced stages of cancer, are less likely to seek health care and potentially suffer from provider bias. However, there is a significant gap in knowledge about racial disparities in outcomes for oncological surgery in Canada. The objective of this study was to perform a scoping review of the current evidence regarding racial disparities in outcomes after oncological surgery in Canada. **Methods:** A database search was conducted on MEDLINE and Epub Ahead of Print, Embase, Clinicaltrials.gov, and the Cochrane Library. All studies on racial disparities in surgical outcomes in Canada were included. The studies were screened and critically analyzed by 2 independent reviewers in line with PRISMA-ScR guidelines. A limited number of studies were identified that were specific to Canada. Studies specific to gastric cancer identified that Chinese and South Asian patients had better survival than the general population. **Results:** One study identified that in ethnically marginalized communities, patients with endometrial cancer were less likely to receive surgery and more likely to experience delays in receiving surgical care. One study identified that Asians had worse prognostic markers at the time of their diagnoses for head and neck cancers, but still had better overall survival than non-Asians. Finally, 1 study identified that there are significant discrepancies in treatment plans for breast cancer among Chinese, Iranian, and South Asian women. **Conclusion:** This review identifies potentially significant racial discrepancies in surgical care and outcomes in Canada for oncological surgery. These disparities likely result from a combination of patient-specific, health-care-specific, and provider-specific biases. However, this review also identifies a relative paucity of data in this area and identifies the need for more primary research to study health outcomes in oncological surgery in racialized communities in Canada.

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Risk of recurrent laryngeal nerve injury from thyroidectomy is lower when intraoperative nerve monitoring (IONM) is used: an analysis of 17 688 patients from the NSQIP database. ***Christina Schweitzer, Sam Wiseman.*** **From the University of British Columbia.**

Background: Recurrent laryngeal nerve (RLN) injury is a serious complication of thyroidectomy. The aim of this study was to determine whether the use of intraoperative nerve monitoring (IONM) during thyroidectomy influenced the risk of RLN injury. **Methods:** Data from 17 688 patients from the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) thyroidectomy database from its introduction in 2016 through 2018 were analyzed, after excluding cases in which IONM use or RLN injury were unknown. The primary outcome evaluated was incidence of RLN injury, defined as occurrence of hoarseness, weak voice, or vocal cord dysfunction beyond the first postoperative day. **Results:** IONM was used in 63.8% of thyroidectomies. There were 1077 RLN injuries in total, an incidence of 6.1%. There was a significantly lower risk of RLN injury associated with the use of IONM during thyroidectomy, from 6.8% without IONM to 5.7% when IONM was used (p = 0.003, relative risk –16.3%, absolute risk –1.1%). For thyroid cancer operations, RLN injury risk decreased from 7.7% to 6.5% with use of IONM (p = 0.039, relative risk –16.6%, absolute risk –1.3%). For operations on benign thyroid disease, risk of RLN injury fell from 6.1% to 5.2% when IONM was employed (p = 0.042, relative risk –15.4%, absolute risk –0.9%). Using multivariate logistic regression modelling, IONM utilization was associated with a significantly decreased risk of RLN injury from thyroidectomy, with an odds ratio of 0.79 (95% confidence interval 0.68–0.92, p = 0.002). Other significant associations included surgery performed on known cancer or final pathology confirming cancer, bilateral thyroid operations, and patient race and/or age. **Conclusion:** Observations made in this large multicentre, present-day, real-world surgical patient population support the utilization of IONM during thyroidectomy, especially when performed for treatment of thyroid cancer, to reduce the risk of a potentially devastating RLN injury.

CANADIAN ASSOCIATION OF THORACIC SURGEONS

01

The impact of the COVID-19 pandemic on non-small-cell lung cancer pathologic stage and presentation. ***Joshua Keogh, Allison Chhor, Housne Begum, Noori Akhtar-Danesh, Christian Finley*. From McMaster University.**

Background: Non-small-cell lung cancer (NSCLC) is often incidentally diagnosed, and the pathologic stage is typically dependent upon timely presentation. Consequently, it is believed that the cessation of normative cancer care services experienced during COVID-19 may result in pathologic upstaging and higher long-term mortality rates. As such, we aimed to understand how the COVID-19 pandemic has negatively affected our patients diagnosed with NSCLC. **Methods:** A single-centre retrospective analysis was conducted to assess how COVID-19 has impacted patient referrals, pathologic stage of NSCLC, mortality rates, and surgical procedures at our centre. Patients ≥ 18 years who had been screened, diagnosed, and treated for NSCLC (primary tumours), and were not in palliative care, were included in this study. **Results:** A total of 695 patients were included for statistical analysis. Outcomes were analyzed and compared according to predefined pre- and post-COVID-19 timeframes (January 2019–February 2020, and March 2020–February 2021, respectively). There was no significant difference between pre- and post-COVID-19 for patient referrals (p = 0.27), tumour size (p = 0.92), number of lymph nodes involved (p = 0.28), or the resultant pathologic stage of cancer (p = 0.95). Additionally, there was no significant difference between pre- and post-COVID-19 for alive status (p = 0.91). Finally, there were no significant differences between pre- and post-COVID-19 for the minimally invasive surgery categorization, type of surgery, or length of stay post-admission (p = 0.23, p = 0.86, and p = 0.77, respectively). **Conclusion:** In alignment with provincial directives, as well as national advocacy by thoracic surgeons at our centre, our institution prioritized cancer surgeries throughout the pandemic while pausing all other elective surgeries, allowing for the maintenance of surgical services throughout the pandemic and prevention of pathologic upstaging and associated worsened prognosis. The proactive preservative strategies and surgeon advocacy at our institution serve to inform health care providers on how to mitigate the risks of critical care disruptions in the future.

02

Screening criteria evaluation for expansion in pulmonary neoplasias (screen). ***Bright Huo, Daria Manos, Zhaolin Xu, Kara Matheson, Samuel Chun, John Fris, Alison Wallace, Daniel French*. From Dalhousie University.**

Background: Low-dose computed tomography (LDCT) screening is recommended for heavy smokers (HS), but 15%–40% of lung cancer patients are light-or-never smokers (LONS). The SCREEN study investigated whether survival differs between lung cancer patients who were eligible (HS) and ineligible (LONS) for LDCT screening to establish whether expanded screening criteria should be studied. SCREEN is a retrospective cohort study of 917 lung cancer cases from 2005 to 2020 at a tertiary Canadian institution. **Methods:** Proportional-hazards models were used to compare mortality risk between HS and LONS, defined by the National Lung Screening Trial (NSLT) criteria and separately by the Nederlands–Leuvens Longkanker Screenings Onderzoek (NELSON) trial criteria. One-year and 5-year survival rates were also compared between HS and LONS. **Results:** The median follow-up was 2.9 years. The cohort comprised 36.9% (NLST, n = 338) and 56.3% (NELSON, n = 516) HS. LONS had a higher proportion of stage 1 cancer than HS (NELSON: 58.7% [n = 216] v. 51.8% [n = 244], p = 0.047). The 5-year overall survival rate was similar between LONS and HS using NLST criteria (55.2% [n = 338] v. 58.5% [n = 529], p = 0.408; hazard ratio [HR] 1.06, 95% confidence interval [CI] 0.80–1.40, p = 0.704) and NELSON criteria (57.6% [n = 401] v. 56.9% [n = 516], p = 0.855; HR 1.02, 95% CI 0.73–1.42, p = 0.925). Multivariate analysis showed males were at increased risk of mortality compared with

females in both the NLST (HR 2.00, 95% CI 1.57–2.54, $p < 0.001$) and NELSON models (HR 2.00, 95% CI 1.58–2.54, $p < 0.001$). **Conclusion:** Survival did not differ between HS and LONS, but there was a higher proportion of stage 1, potentially curable lung cancers among LONS. Smoking status and age alone may be insufficient predictors of lung cancer risk. Additional research is needed to refine lung cancer screening eligibility criteria through expanded risk factor analysis to ensure that screening is effective and equitable.

03

Robotic-assisted lobectomy for early-stage lung cancer provides better patient-reported quality of life than video-assisted lobectomy: early results of the RAVAL trial. ***Yogita S. Patel*, *Jean-Marc Baste*, *Yaron Shargall*, *Thomas K. Waddell*, *Kazuhiro Yasufuku*, *Tiago N. Machuca*, *Feng Xie*, *Lebana Thabane*, *Wael C. Hanna*. From McMaster University (Patel, Shargall, Xie, Thabane, Hanna), Rouen Normandy University (Baste), University of Toronto (Waddell, Yasufuku), and University of Florida (Machuca).**

Background: The primary objective of Phase A of this international prospective blinded randomized controlled trial comparing robotic-assisted lobectomy (RTS) to video-assisted lobectomy (VATS) for early-stage lung cancer is to determine the difference in patient-reported health-related quality of life (HRQOL) between the 2 arms at 12-weeks post-surgery and incremental cost per quality-adjusted life year (QALY) at 12 months post-surgery. **Methods:** Patients with early-stage lung cancer who were candidates for minimally invasive lobectomy were enrolled from January 2016 to July 2020 at 4 academic sites in the United States, Canada, and France. Participants were randomized in a 1:1 ratio to either RTS (intervention) or VATS (control) and blinded to the type of surgery until the 12-month follow-up. The EQ-5D-5L was administered at baseline; postoperative day 1; weeks 3, 7 and 12; and months 6 and 12. Data are presented as mean ± standard deviation. Continuous variables were compared using the Student *t* test. Incremental cost effectiveness ratio was generated by 10 000 bootstrap samples using a bias-corrected and accelerated method, with multivariate imputation by chained equations for missing data in QALY. **Results:** Of 406 patients screened, 45.81% (186 of 406) were randomized (RTS: $n = 92$; VATS: $n = 94$). After final eligibility review, 82 were analyzed in the RTS arm and 83 in the VATS arm. Mean age was 67.36 ± 9.82 years and 66.67% (110 of 165) were women. There were no significant differences in the body mass index, comorbidities, pulmonary function, smoking status, location of tumour, tumour size, or disease stage between arms. The mean 12-week health utility score was 0.85 ± 0.10 for the RTS arm and 0.80 ± 0.19 for the VATS arm (mean difference [MD] 0.05, 95% confidence interval [CI] 0.01–0.09, $p = 0.02$). The incremental cost per QALY of RTS was $14 925.62 (95% CI $6843.69–$23 007.56) at 12 months. **Conclusion:** Early results of the RAVAL trial suggest that RTS lobectomy is a cost-effective intervention that is associated with better patient-reported HRQOL than VATS lobectomy within 12 months of surgery.

04

Breathe Anew: designing and testing the feasibility of a novel intervention for lung cancer survivorship. ***Yogita S. Patel*, *Marla K. Beauchamp*, *Joshua Wald*, *Lawrence Mbuagbaw*, *Brenda L. Key*, *Sheryl M. Green*, *Wael C. Hanna*. From McMaster University (Patel, Beauchamp, Wald, Mbuagbaw, Hanna) and St. Joseph's Healthcare Hamilton (Key, Green).**

Background: We designed and tested the feasibility of Breathe Anew, a multidisciplinary survivorship intervention comprising physical rehabilitation using wearable technology; symptom management through mindfulness-based cognitive therapy (MBCT), and radiological surveillance. **Methods:** Patients who underwent resection for non-small-cell lung cancer at 1 academic site between January 2019 and July 2021 were postoperatively enrolled in this single-arm feasibility trial. Participants were provided with a wearable activity tracker (Fitbit) and an education session on aerobic, deep breathing and mindfulness exercises. Daily step goals were set by increasing the participants' baseline step count by 10% each week until 3 months. The first 25 participants were provided with an in-person group MBCT immersion session at 3 months, while the second was provided a guided mindfulness app (Headspace) for the study duration. The EQ-5D-5L was completed at baseline and 3 months. The primary outcome was compliance with the intervention. **Results:** Of the 92 patients screened, 67.39% (62 of 92) were eligible, and 80.65% (50 of 62) enrolled. Of the 30 ineligible, 86.67% (26 of 30) did not own a smart device. Median age was 66 (range 44–85) years and 58% (29 of 50) were women. Participants spent a median of 85 (range 79–90) days on trial and wore their Fitbits for 79.89% ± 29.19% of days. The mean baseline daily step count for this cohort was 2458 ± 2101 steps, and daily step goals were achieved in 74.06% ± 26.15% of days. For the mindfulness component, 44.00% (11 of 25) attended the in-person group session, while 56.00% (14 of 25) used Headspace. Routine radiological surveillance appointments were attended by 100% (40 of 40) of the participants who required it. Significant improvement was seen in the overall health component of the EQ-5D-5L from before to after the intervention (64.69 ± 23.68 v. 78.14 ± 14.03, $p = 0.0003$). **Conclusion:** A postoperative survivorship intervention for lung cancer survivors is feasible based on the encouraging recruitment rate, and compliance rates with the physical rehabilitation and radiological surveillance components of the intervention. However, the MBCT component needs to be modified to improve compliance.

05

Learning objectives for thoracic surgery: developing a national standard for undergraduate medical education. ***Uzair Jogiat*, *Abdollah Behzadi*, *Laura Donahoe*, *Awrad Nasralla*, *Julius Poon*, *Najib Safieddine*, *Nazgol Seyednejad*, *Iran Tavakoli*, *Simon Turner*. From University of Alberta (Jogiat, Nasralla, Turner), University of Toronto (Behzadi, Donahoe, Safieddine, Tavakoli), Université de Sherbrooke (Poon), and University of British Columbia (Seyednejad).**

Background: The Education and Continuing Professional Development Committee (ECPDC) of the Canadian Association of Thoracic Surgeons (CATS) has defined a goal of describing the essential knowledge of thoracic surgery for primary care physicians and other nonsurgeons. The objective of this research was to develop a national standardized set of undergraduate learning objectives for thoracic surgery. **Methods:** Institutional thoracic surgery learning objectives were obtained from 4 medical schools in Canada. These 4 institutions were selected to provide a broad geographic representation from medical schools of varying sizes and of both official languages. The resulting list of learning objectives underwent critical review by the ECPDC, made up of 5 Canadian community and academic thoracic surgeons, 1 thoracic surgery fellow and 2 general surgery residents. A national survey was developed and circulated by CATS. The survey was sent to all CATS members (n = 209). Respondents were asked to indicate on a 5-point Likert scale whether each objective "should be a priority for all medical students" (strongly disagree = 1, strongly agree = 5). **Results:** Out of the 209 CATS members, 56 responded (response rate 27%). The average experience in clinical practice among survey responders was 10.6 ± 10.0 years. Most survey responders were from Ontario (38.9%). Most survey responders teach or supervise medical students monthly (37.0%), with one-third reporting this daily (29.6%). Eight out of the 10 proposed objectives received a mean Likert score of 4/5 or higher and were selected for inclusion in the final list. Following final review from the ECPDC and CATS Executive Committee, a finalized list of 8 learning objectives was created. **Conclusion:** A standardized set of learning objectives reflective of the core concepts within thoracic surgery was developed for medical students using a systematic approach.

06

Plasma cell-free DNA as a point-of-care well-being biomarker for early-stage non-small-cell lung cancer patients. ***Anna L. McGuire, Sohat Sharma, Roy A. Hilzenrat, Melissa McConechy, Ingrid Frank, Curtis Hughsman, Stephen Yip, James J. Choi, John Yee.*** **From Vancouver Coastal Health at Vancouver General Hospital and Vancouver Coastal Health Research Institute (McGuire, Choi, Yee), University of British Columbia (McGuire, Sharma, Hilzenrat, Frank, Choi, Yee), Canexia Health Inc. (McConechy), and Cancer Genetics and Genomic Laboratory — BC Cancer (Hughsman, Yip).**

Background: Operative lung cancer patients often possess smoking-associated comorbidity, including coronary artery disease (CAD) and chronic obstructive pulmonary disease (COPD). The Charlson Comorbidity Index (CCI) is currently used to quantify well-being and risk of postoperative complications. An objective biomarker surrogate for well-being, such as circulating cell-free DNA (cfDNA), could aid in operative risk estimation. The objective of this pilot study was to examine the association between plasma cfDNA yield before lung cancer surgery and CCI in order to provide evidence for clinical utility as a point-of-care well-being biomarker. **Methods:** Clinical variables and presurgery 30 mL whole blood samples were prospectively collected in adults with operative early-stage lung cancer. CCI was tabulated and plasma processed to establish cfDNA yield (ng/mL). Box plots were constructed for ng/mL ctDNA by CCI. A multiple linear regression model was developed to predict cfDNA yield dependant on CCI score, adjusted for independent variables identified a priori to be of clinical relevance, including age, sex, smoking status, pT stage, and SUVmax. A $p > 0.05$ was considered statistically significant. **Results:** Among 55 study participant, plasma cfDNA yield before thoracic surgery was significantly different between CCI categories (p = 0.004). We further observed a significantly higher cfDNA yield per mL/plasma concentration for those with a very high CCI ≥ 5 compared with those with CCI < 5 (p = 0.002). This is a clinically important finding, as patients with CCI ≥ 5 are at highest risk of postoperative adverse events. **Conclusion:** Plasma cfDNA yield was associated with elevated CCI score before thoracic surgery for early-stage lung cancer. This preliminary observation suggests that plasma cfDNA could serve as a point-of-care biomarker for lung cancer patient well-being.

07

Sarcopenia determined by skeletal muscle index predicts overall survival, disease-free survival and postoperative complications in resectable esophageal cancer: a systematic review and meta-analysis. ***Uzair Jogiat, Hannah Sasewich, Simon Turner, Vickie Baracos, Dean Eurich, Heather Filafilo, Eric Bedard.*** **From the University of Alberta.**

Background: In esophageal cancer, patients are at increased risk of malnutrition and sarcopenia, ultimately contributing to poor outcomes. **Methods:** A systematic review was conducted to determine whether sarcopenia, defined by the skeletal muscle index, is predictive of overall survival (OS), disease-free survival (DFS), and postoperative complications in resectable esophageal cancer. A systematic search of MEDLINE, Embase, Scopus, Web of Science, and Cochrane Library was conducted according to PRISMA guidelines up until Jan. 30, 2021. The primary outcome was overall survival; secondary outcomes included disease-free survival, pulmonary complications, and anastomotic leak. A meta-analysis was conducted to evaluate the differences in OS and DFS between patients with and without sarcopenia. Estimated effects were calculated with an inverse variance random-effects model for OS and DFS and a Mantel–Haeszel random-effects model for postoperative complications. Heterogeneity was quantified using the I^2 statistic. **Results:** Twenty-one studies (4 prospective, 17 retrospective, 3966 patients) were included. Sarcopenia was present in 1940 (48.1%) patients and was associated with lower OS (hazard ratio [HR] 1.56, 95% confidence interval [CI] 1.25–1.95, p = <0.00001, I^2 = 71%) and DFS (HR 1.73, 95% CI 1.04–2.87, p = 0.03, I^2 = 51%). A decrease in skeletal muscle index, independent of sarcopenia status, was associated with lower overall survival (HR 1.81, 95% CI 1.20–2.73, p = 0.005, I^2 = 92%). Sarcopenia was associated with increased odds of pulmonary complications (odds ratio [OR] 1.86, 95% CI 1.29–2.66, p = 0.0008, I^2 = 41%) and increased odds of anastomotic leak (OR 1.46, 95% CI 1.11–1.93, p = 0.008, I^2 = 0%). **Conclusion:** Sarcopenia is a predictor of OS, DFS, and postoperative complications in patients with resectable esophageal cancer. Studies on the modifiability of sarcopenia in the preoperative period will help determine the utility of nutritional interventions.

08

The short- and long-term effects of open v. minimally invasive thymectomy in myasthenia gravis patients: a systematic review and meta-analysis. ***Yung Lee*, *Yasith Samarasinghe*, *Janhavi Patel*, *Adree Khondker*, *Tyler McKechnie*, *Nadeesha Samarasinghe*, *Christian Finley*, *Wael Hanna*, *Yaron Shargall*, *John Agzarian*. From McMaster University (Lee, Y. Samarasinghe, Patel, McKechnie, Finley, Hanna, Shargall, Agzarian), University of Toronto (Khondker), and Western University (N. Samarasinghe).**

Background: Thymectomy has been used as a treatment for myasthenia gravis (MG) for many decades, with both open and minimally invasive surgery (MIS) techniques currently used. Although MIS has shown improved short-term results, long-term effects remain uncertain. This systematic review and meta-analysis aims to compare the postoperative and long-term outcomes of MIS v. open thymectomy in MG patients. **Methods:** MEDLINE, Embase and CENTRAL databases were searched from inception to January 2022 for keywords related to MG and open or MIS thymectomy. The primary outcome was complete stable remission (CSR), and secondary outcomes were clinical improvement, complications, length of stay, operation time, and blood loss. The Grading of Recommendations, Assessment, Development, and Evaluation was used to assess the certainty of evidence. **Results:** After screening, 26 studies with 3588 patients were included in the analysis. No statistical difference was noted in CSR between open v. MIS thymectomy at 1 year (relative risk [RR] 1.25, 95% confidence interval [CI] 0.96–1.63, $p = 0.10$, $I^2 = 13\%$, 15 studies, low certainty), 3 years (RR 1.15, 95% CI 0.90–1.48, $p = 0.27$, $I^2 = 44\%$, 11 studies, moderate certainty), and 5 years (RR 1.04, 95% CI 0.90–1.19, $p = 0.60$, $I^2 = 0\%$, 7 studies, moderate certainty). However, in nonthymomatous patients, 1-year CSR was improved by 38% after MIS thymectomy compared with open (RR 1.38, 95% CI 1.04–1.83, $p = 0.03$, $I^2 = 8\%$, 8 studies, moderate certainty). There was no significant difference in rates of clinical improvement between techniques at 1 year. **Conclusion:** Despite showing improvement following MIS thymectomy, analyses on hospital stay, blood loss and operation showed considerable heterogeneity. This is the first systematic review and meta-analysis assessing long-term effects of MIS v. open thymectomy in MG patients. Given the lack of significant differences noted, either MIS or open thymectomy can be performed, based on surgeon preference. Further high-level, long-term research should be conducted to determine the specific benefit of each technique.

09

Optimizing opioid prescribing practices following minimally invasive lung resections through a structured quality improvement process. ***Evan Barber*, *Melissa Whidden*, *Francisco Aguirre*, *Andrew Graham*. From the University of Calgary.**

Background: Canada is experiencing an opioid crisis; surgeons must balance pain control with potential harm. The Canadian Association of Thoracic Surgeons (CATS) recently published guidelines regarding opioid prescriptions. For minimally invasive (video-assisted thoracoscopic surgery [VATS]) lung resections, 120 morphine milligram equivalents (MME) is recommended. **Methods:** We undertook a quality-improvement (QI) project to optimize opioid prescribing following VATS lung resections at our centre. A linkage of prospective institutional and provincial databases was developed. Opioid-naïve patients were included. In 12 months pre-intervention, 173 patients were identified; average discharge prescriptions were 158 MME, with 51% exceeding guideline quantities. This confirmed room for improvement. Within a structured QI framework, 2 interventions were selected: incorporation of CATS guidelines into our postoperative care pathway, and development of a patient information handout regarding opioids. The outcome measure was average MME of discharge prescriptions, the process measure was percentage of prescriptions exceeding guidelines, and the balancing measure was opioid refills within 90 days of discharge. Data were analyzed using control charts with 2-week subgroups, and traditional statistics comparing pre- and postintervention groups. **Results:** In 12 months post-intervention, 175 patients were identified. Average discharge prescriptions were 100 MME (v. 158 MME; $p = 0.0003$) with 19% (v. 51%; $p < 0.0001$) of prescriptions exceeding guidelines. This equates to an average reduction of 14.5 mg oral hydromorphone per patient. Control charts showed special cause variation corresponding with the intervention, and system stability existed post-intervention. **Conclusion:** There was no statistically significant difference in opioid refill prescriptions following intervention; control charts confirmed no special cause variation in refills associated with the intervention. The use of a structured QI framework incorporating CATS opioid guidelines was associated with a significant reduction in the average dose of opioids prescribed at discharge, improved practitioner adherence to prescribing guidelines, and no increase in opioid refill prescriptions following VATS lung resections.

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Effects of virtual postoperative postdischarge care in patients undergoing lung resection during the COVID-19 pandemic. ***Gileb-Gol Akhtar-Danesh*, *Allison Chhor*, *Housne Begum*, *Joycelyne Ewusie*, *Lawrence Mbuagbaw*, *Shargall Yaron*. From McMaster University.**

Background: The COVID-19 pandemic has impacted the landscape of health care delivery, including a significant uptake in the use of virtual medicine. In our institution, this includes virtual visits for routine postoperative follow-up in patients undergoing major lung resections. The aim of this study was to evaluate the effects of COVID-19 on postoperative outcomes, and whether virtual follow-ups are associated with worse postoperative outcomes compared with in-person visits. **Methods:** A retrospective, single-centre propensity-matched cohort analysis was conducted. Patients undergoing anatomic lung resections were included. Outcomes of interest included 60-day readmission, emergency department (ED) visits, mortality, and complication rates. Initial analysis compared pre-COVID-19 (January–December 2019) patients to those receiving either in-person or virtual follow-up during the pandemic (March 2020–February 2021). Secondary analysis compared COVID-19-era patients receiving mixed in-person/virtual follow-up (hybrid) to

those receiving completely virtual care (no in-person visits). **Results:** In total, 1282 patients were assessed for eligibility. After propensity matching, 128 patients were included in the COVID-19-era group, and 212 patients in the pre-COVID-19 group. Baseline characteristics were similar in both groups. Initial analysis showed no statistically significant differences between COVID-19-era and pre-COVID-19 patients in terms of 60-day readmission (5.5% v. 7.5%, $p = 0.57$), ED visits (4.7% v. 6.6%, $p = 0.77$), mortality (0.8% v. 0.0%, $p = 0.99$), or complications. After subdividing patients with hybrid v. completely virtual follow-up, there was no significant difference in any outcome of interest ($p > 0.05$ for all). **Conclusion:** In our experience, early postoperative outcomes during the COVID-19 era were not inferior to those before COVID-19. Furthermore, evaluation of the impact of complete virtual follow-up for patients undergoing anatomic lung resection showed no significant differences in clinical outcomes compared with routine in-person follow up, suggesting that postoperative, postdischarge care might not be compromised by eliminating routine in-person assessments after major lung surgery.

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Initiating Ethiopia's first minimally invasive surgery program: a novel approach for collaborations in global surgical education. ***Adom Bondzi-Simpson*****,** ***Melanie Keshishi*****,** ***Yonas Ademe*****,** ***Ayalew Tizazu*****,** ***Marci Rose*****,** ***Sameena Uddin*****,** ***Michael Ko*****. From University of Toronto (Bondzi-Simpson, Keshishi, Rose, Uddin, Ko) and Addis Ababa University (Ademe, Tizazu).**

Background: Complex lung diseases are among the leading causes of death in Ethiopia. Access to thoracic surgery is limited, and before 2016, no thoracic surgeons were trained in minimally invasive surgery (MIS). A global academic partnership was formed between the University of Toronto and Addis Ababa University (AAU). Here, we describe implementation of the first MIS training program in sub-Saharan Africa and evaluate its safety. **Methods:** We conducted a retrospective cohort analysis of open v. MIS thoracic and upper gastrointestinal procedures performed at AAU from Jan. 1, 2016, to June 1, 2021. Baseline demographic, diagnostic, operative and postoperative outcomes, including length of stay (LOS) and complications, were compared. In our bilateral model of surgical education, training was provided in Ethiopia and Canada over 2 years with focus on capacity building through egalitarian forms of knowledge exchange. Program features included certification in fundamentals of laparoscopic surgery, high-fidelity lobectomy simulation and hands-on training. **Results:** Overall, 41 open and 56 MIS cases were included in the final statistical analysis. The average LOS in the MIS group was 5.2 days v. 11.0 days in the open group ($p < 0.001$). The overall complication rate was 18% in the MIS group v. 39% open ($p = 0.020$). **Conclusion:** Here we demonstrated the successful initiation of sub-Saharan Africa's first MIS program in thoracic and upper gastrointestinal surgery with a > 50% reduction in LOS and overall complications. We envision the MIS program as a template to continue expanding global partnerships and improving surgical care in other resource-limited settings.

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Patient outcomes following salvage lung cancer surgery after definitive chemotherapy or radiation. ***Riley Bowker*****,** ***Jimmy Ddamba*****,** ***Daniel French*****,** ***Alison Wallace*****. From Dalhousie University.**

Background: Definitive chemoradiotherapy (dCRT) is an option for patients with lung cancer who are medically inoperable or have unresectable locally advanced disease. The local recurrence rate after dCRT is 30% and the prognosis is poor. Salvage surgery, or surgical resection of recurrent disease following dCRT, is 1 therapeutic option; however, optimal therapy for locoregional recurrences or residual disease is controversial. The purpose of this study was to determine the efficacy of salvage lung resection. **Methods:** This was a single-centre retrospective database review. Patients eligible for the study received definitive chemotherapy, radiation therapy or both, followed by salvage pulmonary resection for local recurrence or residual disease. Patient characteristics and outcomes were examined. **Results:** Sixteen patients (11 male, 5 female) out of 201 who met the inclusion criteria treated between January 2017 and August 2020 were identified with a median follow-up time of 21 months (interquartile range [IQR] 8–37.5). The median patient age was 68 years. All 16 patients received radiation, 7 of whom received < 59 Gy and 9 of whom received > 59 Gy. The rationale for dCRT varied as 6 patients had disease considered to be unresectable, 5 patients were originally considered to be medically inoperable, 4 patients had a preference for nonsurgical management initially, and 1 patient pursued dCRT owing to uncertainty of surgical options because of the COVID-19 pandemic. The median time from radiotherapy to surgery was 22 months (IQR 14.25–27.5). The extent of salvage resections differed, as 5 patients had wedge resections, 4 had lobectomies, and 5 patients had > 1 lobe resected. No pneumonectomies were performed. Two resections were aborted in the operating room owing to upstaging at the time of resection. The final pathology was 9 adenocarcinomas, 5 squamous cell carcinomas, 1 adenosquamous carcinoma and 1 nonmalignant (nodular fibroblastic scarring with surrounding focal organizing pneumonia). Median procedure time was 3h 10.5 min. Adhesions were noted in 12 cases (75%). Ninety-day mortality was 0%. Overall survival at the most recent follow-up was 75% (12 patients). **Conclusion:** Salvage pulmonary resection after dCRT can be performed with low morbidity and mortality rates and is a good option for treatment of recurrent or residual disease after dCRT.

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Replacing chest X-rays after chest tube removal with clinical assessment in postoperative thoracic surgery patients. ***Negar Ahmadi*****,** ***Najib Safieddine*****,** ***Sayf Gazala*****,** ***Carmine Simone*****. From University of Toronto.**

Background: Thoracic surgery patients undergo several chest X-rays (CXRs) during their postoperative course. The literature on the value of CXRs after chest tube removal in influencing management and adverse outcomes in thoracic surgery patients remains limited. Interventions, if any, after chest tube removal are often performed for clinical symptoms as opposed to CXR findings. The primary objective of this study was to assess the impact of replacing CXRs after chest tube removal with clinical

observation on patient-related outcomes in thoracic surgery patients. The secondary objective of this study was to investigate the impact of eliminating CXRs on postoperative length of stay and hospital admission costs. **Methods:** This was a single-institution prospective study of thoracic surgery patients undergoing elective lung resection (lobectomy, segmentectomy, wedge resection). CXR after chest tube removal was replaced with clinical observation for 2h after chest tube removal in those meeting the inclusion criteria. Patients with any concerning clinical symptoms were assessed with a CXR. **Results:** This study is still undergoing, and the reported results are preliminary. Since the start of the study a month ago, 22 patients have been accrued. The median age is 69 years (interquartile range 65–78) and 36% (n = 8) are males. Sixteen patients (73%) were only clinically observed after their chest tube removal with no CXR upon discharge. Six patients underwent CXR after chest tube removal, 4 of whom had mild symptoms. All CXRs after chest tube removal were normal. **Conclusion:** CXR after chest tube removal can be successfully eliminated in thoracic surgery patients and be safely replaced with clinical observation. This change in practice will require culture change and education among all health care workers involved in the care of thoracic patients.

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Updating the practice of thoracic surgery in Canada: a survey of the Canadian Association of Thoracic Surgeons. ***Sami A. Abdul*, *Frances Wright*, *Christian Finley*, *Patrick J. Villeneuve*, *Sebastian Gilbert*, *Sudhir Sundaresan*, *Andrew J.E. Seely*, *Donna E. Maziak*. From The Ottawa Hospital (Abdul, Villeneuve, Gilbert, Sundaresan, Seely, Maziak), University of Toronto (Wright), McMaster University (Finley), and University of Ottawa (Villeneuve, Gilbert, Sundaresan, Seely, Maziak).**

Background: The aim of this study was to update our 2004 report describing the demographics, training, and trends in compliance to standards of practice for thoracic surgery in Canada. **Methods:** We updated our questionnaire and administered it to all members of the Canadian Association of Thoracic Surgeons via email (n = 142 v. n = 68 in 2004). We detail with data from Ontario Health and the Canadian Partnership Against Cancer (CPAC) reporting provincial and national trends. **Results:** Fifty-five surgeons completed the survey (38.7% v. 69% in 2004), with a demographic distribution of 69% males with a mean age of 50.0 ± 9.3 years. Most surgeons serve a patient population of more than 1 million per centre (69%) at an average on-call ratio of 1:4 or 1:5 (28%–32%), averaging 56.4h ± 12.3h per week. Greater dedicated geographic units per centre (61.8% v. 53%) have resulted in an increase in thoracic-associated services and house staff, notably endoscopy units (100% v. 91%), with 76% having access to both endobronchial and endoscopic ultrasound. There is greater access to thoracic radiology, particularly positron emission tomography scanners, per centre (100% v. 13%). The frequency of annual case volumes for lung resections (255 v. 128), esophageal resections (41 v. 19), mediastinal resections (31 v. 13) and hiatal hernia repair (44 v. 1.6) have increased substantially despite operating room availability and radiology as prominent rate-limiting steps. **Conclusion:** Our data, coupled with the Ontario Health and CPAC's reported wait times and mortality data, indicate a need to address resource access and utilization. This survey characterizes the landscape of compliance to current standards of practice, addressing the needs of thoracic surgeons across Canada. Over 85% were aware of our previous compliance paper (2004), and this allowed 37% to apply for resource and equipment needs based on the paper's results.

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The impact of COVID-19 on the diagnosis and treatment of lung cancer. ***Pooja Patel*, *Daria Manos*, *Alison Wallace*, *Madelaine Plourde*. From Dalhousie University.**

Background: The implications of the SARS-CoV-2 pandemic declared in March 2020 on lung cancer diagnosis and management in Canada have not yet been elucidated. A standardized lung cancer screening program has not yet been implemented in Canada. The majority of referrals for the assessment of suspicious lung nodules are based on incidental findings on chest X-rays and chest computed tomography (CT) scans done for other reasons. **Methods:** This was a retrospective cohort study, in the form of a chart review, of patients undergoing diagnostic imaging within the province of Nova Scotia and subsequently referred to a thoracic surgeon at the province's only tertiary care centre for surgical management of their lung cancer between March 2019 and March 2021. The objectives of this study were to quantify the provincial volume of diagnostic imaging, including chest X-rays and chest CTs, and thoracic surgeon referrals for lung cancer that were coded as lung lesions, effusions, masses, malignancy, or cancer. Standard descriptive statistics were used for analysis. **Results:** An overall decrease of 6.5% of thoracic surgeon referrals (p = 0.49) was experienced when comparing the pre- and post-COVID-19 periods. Overall provincial diagnostic imaging volumes decreased by 21.5% (p = 0.038), of which 28 049 were outpatient scans (p = 0.005) and 8651 were emergency department scans (p = 0.299). Outpatient chest X-ray frequency decreased by 38.1% (p = 0.001), with no significant differences for chest CT frequency. **Conclusion:** The SARS-CoV-2 pandemic has led to significant reductions in diagnostic imaging and subsequent thoracic surgeon referrals for the assessment of pulmonary pathology. Further understanding of the implications of reduced or delayed diagnostic imaging on patient staging at time of referral, and subsequent morbidity and mortality is required.

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Development of a prediction model for survival time in esophageal cancer patients treated with resection. ***Lyndsay Harrison*, *Donna Turner*, *Jolie Ringash*, *Douglas Manuel*, *Biniam Kidane*, *Vaibhav Gupta*, *Kathleen Decker*, *Laura Davis*, *Gail Darling*, *Carolyn Compton*, *Natalie Coburn*, *Randy Boyes*, *Michael Pugliese*, *Alyson Mahar*, *Amy Hsu*. From University of Manitoba (Harrison, Turner, Kidane, Decker, Mahar), University of Toronto (Ringash, Gupta, Coburn), University of Ottawa (Manuel, Hsu), ICES (Manuel, Pugliese, Mahar), McGill University (Davis), Dalhousie University (Darling), Arizona State University (Compton), and Queen's University (Boyes).**

Background: Clinical prediction tools offer an accessible way to combine multiple pieces of information and create personalized survival predictions for patients and providers. Existing prediction tools for survival in esophageal cancer have had limited clinical utility because they did not adhere to best practices for model development and validation. We report on the development of a prediction model for 3-year survival following surgical resection for esophageal cancer using a contemporary cohort of patients in one Canadian province. **Methods:** We compared the performance of a base model limited to patient and disease characteristics routinely collected in administrative health databases and available at the time a decision for surgical resection was made (e.g., age, sex, histology, neoadjuvant therapies, comorbidities), and a pathology model that additionally included pathology specimen details (e.g., T stage, number of lymph nodes examined). Cox proportional hazards models were fit to predict likelihood of dying in the 3 years following resection. Model performance was assessed using overall calibration and discrimination (c-statistics). The cohort of 2124 patients consisted of all provincial patients who underwent surgical resection for esophageal cancer between May 1, 2004, and June 30, 2016, for whom a pathology record was available. **Results:** Median age was 66 years, with 80% males and 85% adenocarcinomas. Survival data were available until Mar. 31, 2020. The model with pathology data performed much better than the base model. The calibration plot slope was 1.02 and intercept –0.01, and optimism-corrected c-statistic 0.77, compared with the base model with calibration plot slope 0.95, intercept 0.02, and c-statistic 0.60. **Conclusion:** Overall, the pathology model showed good predictive performance, highlighting the continued importance of pathological stage data for survival prediction. Our model could be used by patients and providers following esophagectomy for a personalized understanding of 3-year prognosis. External validation in another province is ongoing.

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The development and validation of a mixed reality thoracic surgical anatomy atlas. *Ge Shi*, *Andrew Kokavec*, *Edward Ho*, *Ryan Waterman*, *Edward Wang*, *Kiera Harnden*, *Richard Malthaner*, *Rahul Nayak*, *Mehdi Qiabi*. From Western University (Shi, Kokavec, Ho, Waterman, Wang, Malthaner, Nayak, Qiabi) and University of British Columbia (Harnden).

Background: New extended reality technologies (augmented, mixed, and virtual realities) are being increasingly used to enhance workplace training. A mixed reality (MR) application to teach thoracic surgical anatomy has not yet been described. The aim of our project was to develop and validate an interactive MR thoracic surgical anatomy atlas. **Methods:** We obtained a computed tomography (CT) scan of the chest and used 3D modelling and development software to create our application for the MR platform, Microsoft's HoloLens 2. Forty-one volunteers from various career stages were recruited and guided through a 20-minute session using our developed model. A validated 5-point Likert scale questionnaire to assess the comfort and functionality of the application was then administered. Quantitative nonparametric statistical analyses were performed as appropriate. **Results:** The device was felt to be safe (100%), comfortable (85%), and nearly all would recommend the application to their peers (98%). Medical students more strongly felt that the application was an asset for anatomy teaching than residents and consultants (5.0 v. 4.5 v. 5.0, p = 0.009). More medical students also felt that medical schools should offer extended reality learning tools as part of their repertoire compared with residents and consultants (4.9 v. 4.5 v. 4.2, p = 0.023). Males felt increased motivation to study with this application compared with females (4.8 v. 4.3, p = 0.046) but also on average were more familiar (2.4 v. 1.5, p = 0.008) and comfortable (4.7 v. 4.2, p = 0.047) with extended reality technologies. Overall, participants felt the application was easy to use and there was no significant difference between medical students, residents, and consultants. **Conclusion:** We succeeded in the development of an MR thoracic surgical anatomy atlas. Furthermore, it has been validated as a comfortable, functional, easy-to-use, and desirable modality for learning thoracic anatomy for all stages of learners. These results support further development of extended reality technologies in thoracic surgery education.

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Routine placement of feeding tubes should be avoided in esophageal cancer patients undergoing surgery. *Ge Shi*, *Richard Malthaner*, *Rahul Nayak*, *Mehdi Qiabi*. From Western University.

Background: Perioperative nutritional optimization of patients undergoing esophagectomy for cancer is important as this population is prone to malnutrition, which is associated with poor outcomes. Nutritional status supplementation has been achieved via enteral nutrition through percutaneous feeding tubes such as gastrostomy tubes (G-tubes) placed by interventional radiology and surgical jejunostomy tubes (J-tubes). While we routinely place these for patients undergoing esophagectomy, these are not benign and are associated with adverse events, including infections, dislodgement, reintervention, and increased health care visits. The morbidity associated with percutaneous feeding tubes and their risk factors have not been identified in the literature. We aimed to determine the factors associated with adverse outcomes after feeding tube placement. **Methods:** We retrospectively studied patients at our institution who underwent esophagectomy for an esophageal carcinoma and had at least 1 feeding tube placed between November 2018 and October 2021. **Results:** A total of 99 patients were included, with 145 feeding tubes placed. Fifty-one patients had G-tubes and 94 had J-tubes. The overall rate for experiencing any adverse event associated with feeding tubes was 41%. Of these, 12% were wound infections, 19% required procedural reintervention, 14% visited the emergency department and 3.4% of patients required admission to hospital owing to feeding tube–related issues. Current or previous smoking history was a significant risk factor for overall complications when compared with never-smokers (45% v. 27%, p = 0.050). Age ≥ 70 years was associated with increased risk of wound infections (18% v. 7.1%, p = 0.044). There were no significant differences seen in complication rates when comparing G- and J-tubes (37% v. 43%, p = 0.54), feeding tubes placed before and during time of esophagectomy (41% v. 41%, p = 0.98), or with laparoscopic and open technique (45% v. 42%, p = 0.75). **Conclusion:** We found significant morbidity due to complications related to both G- and J-tubes. The routine use of feeding tubes in esophagectomy patients should be avoided.

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Nodal count is no different during robotic segmentectomy compared with robotic lobectomy. ***Jacob A. Alaichi, Yogita Patel, Forough Farrokhyar, Marko Simunovic, Wael C. Hanna*. From McMaster University.**

Background: The debate to perform segmentectomy v. lobectomy for lung cancer tumours sized 2–3 cm is ongoing. Appropriate nodal dissection improves pathologic staging and may impact survival after lung cancer surgery. The objective of this study was to compare the extent of intraoperative lymph node sampling in patients undergoing robotic segmentectomy to robotic lobectomy for non-small-cell lung cancer tumours 2–3 cm in size. **Methods:** We conducted a secondary analysis of a prospectively collected database. Baseline characteristics, intraoperative outcomes, lymph node stations sampled, and tumour size were collected for all patients undergoing robotic pulmonary surgery. A per-protocol analysis was performed, comparing participants who underwent robotic segmentectomy to robotic lobectomy for tumours with a maximal diameter < 3 cm. Comparisons of the number of lymph node stations sampled were done using a 2-tailed Mann–Whitney *U* test. A subanalysis was performed for participants with tumour size between 2 and 3 cm. Level of significance was set at $\alpha = 0.05$. **Results:** We analyzed 245 patients with tumours < 3 cm, with 147 undergoing robotic segmentectomy (60.0%) and 98 undergoing robotic lobectomy (40.0%). Median age was 68 years (interquartile range [IQR] 62–74) and 37.1% were men. The median number of lymph node stations sampled was no different in both groups, with 6 (IQR 5–7) stations sampled ($p = 0.059$). Ninety-three participants (38.0%) presented with tumour size between 2 and 3 cm, and there were no significant differences in the number of lymph node stations sampled (segmentectomy [$n = 48$]: 6, IQR 4–7; lobectomy [$n = 45$]: 6, IQR 6–7, $p = 0.133$). **Conclusion:** The number of lymph node stations sampled during robotic pulmonary surgery appears to be no different between segmentectomy and lobectomy. Segmentectomy may be a viable surgical alternative for early-stage tumours 2–3 cm in size.

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Point-of-care ultrasound-guided percutaneous biopsy of solid masses in the thoracic outpatient clinic: a safe, high-yield procedure to accelerate tissue diagnosis for patients with advanced thoracic malignancy. ***Biniam Kidane, Stephen Gowing, Richard Liu, Sadeesh Srinathan, Larry Tan*. From the University of Manitoba.**

Background: Thoracic surgery cancer patients often undergo biopsy as part of their workup for tissue diagnosis and to determine best systemic therapies. This often requires endobronchial ultrasound, bronchoscopy or incisional biopsies in the endoscopy unit or operating room or referral to radiology for computed tomography (CT)-guided percutaneous biopsies. In our centre, this results in significant delays to patients receiving treatment, particularly patients who present with advanced disease. **Methods:** We launched a pilot program of ultrasound-guided biopsy in the outpatient thoracic clinic and sought to determine if it could provide a safe, rapid and reliable alternative for obtaining tissue diagnosis in patients with advanced thoracic malignancy. **Results:** We included 22 patients from a prospectively maintained database at a single academic thoracic surgery institution for analysis. All biopsies were performed by 3 thoracic surgeons from July 2021 to March 2022. Using bedside ultrasound, 20-gauge tissue cores were obtained using multiple passes with a standard injector or spinal needle. Tissue sites biopsied included lung ($n = 12$), liver ($n = 6$), manubrium ($n = 1$) and chest wall ($n = 1$). Tissue diagnosis was obtained in 20 patients (91%). Tissue diagnoses obtained included small-cell lung cancer ($n = 3$), non-small-cell lung cancer ($n = 8$), poorly differentiated carcinoma ($n = 4$), thymic carcinoma ($n = 2$), B cell lymphoma ($n = 1$), metastatic adenocarcinoma ($n = 1$), and rhabdoid sarcoma ($n = 1$). There was sufficient tissue for molecular testing. There were no postprocedure pneumothoraxes or complications. This resulted in reduced time to diagnosis, quicker initiation of systemic or radiation therapies and reduced health resource utilization. **Conclusion:** Thoracic surgeons can safely and rapidly obtain tissue diagnosis using ultrasound-guided biopsy in the outpatient clinic. This low-cost procedure can be adopted as part of comprehensive thoracic malignancy assessment and can accelerate patient access to cancer treatment, particularly for patients with advanced thoracic malignancies.

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Sarcopenia and modified frailty index are not associated with adverse outcomes after esophagectomy for esophageal cancer: a retrospective cohort study. ***Linda Chang Qu, Richard Malthaner*. From Western University.**

Background: The high risk of postoperative complications after an esophagectomy — an integral part of treatment for esophageal cancer — indicates the importance of preoperative risk assessment. Frailty and sarcopenia, defined as loss of skeletal muscle, are 2 measures of decreased physiologic reserve that have been associated with poor outcomes in cancer patients. This study was the first to assess both frailty and sarcopenia in the same cohort of patients with esophageal cancer undergoing esophagectomy to determine if 1 metric was better associated with adverse postoperative outcomes. **Methods:** We retrospectively reviewed all patients who underwent an esophagectomy at our health institution from 2010 to 2016. Frailty was scored using the 5-factor Modified Frailty Index (mFI-5) and sarcopenia was determined based on skeletal muscle index (SMI) measured from preoperative computed tomography (CT). **Results:** A total of 205 patients were included in the analysis. There were 118 sarcopenic patients (57.6%). No patients had an mFI-5 score higher than 3 of 5. Unplanned intensive care unit admission occurred in 19% (39 of 205) of patients. Deaths within 30 days, which were all in-hospital, occurred in 3.4% (7 of 205). Ninety-day mortality was 5.4% (11 of 205). Readmission within 30 days occurred in 17.1% (35 of 205). Return to the operating room occurred in 22.4% (46 of 205), while 25.4% (52 of 205) of patients experienced an anastomotic leak and 8.3% (17 of 205) experienced a chylothorax. On multivariate regression analyses controlling for age, American Society of Anesthesiologists (ASA) classification, and neoadjuvant therapy status, there was no significant association between either

sarcopenia or mFI-5 score and major postoperative complications. **Conclusion:** Sarcopenia and frailty are markers of physiologic vulnerability but may not correspond with statistically and clinically significant outcomes. The interaction between preoperative factors that affect measures of physiologic reserve may be more nuanced and should be further explored in a prospective manner with a larger patient population.

22

Near-infrared-guided segmental resection for lung cancer: an analysis of the learning curve. ***Jacob Alaichi, Peter Malik, Yogita Patel, Wael Hanna.* From McMaster University.**

Background: Robotic-assisted segmentectomy is emerging as a standard operation for early-stage non-small-cell lung cancer (NSCLC). Segmentectomy is associated with a demanding learning curve, owing to various patterns in segmental anatomy and shape of the intersegmental plane. The objective of this study was to estimate the number of cases required to attain proficiency in near-infrared (NIF)-guided segmental resection. **Methods:** This was a single-arm prospective trial of patients undergoing robotic-assisted segmentectomy for NSCLC tumours < 3 cm. Intraoperative identification of the invisible intersegmental plane was facilitated by NIF mapping following intravenous indocyanine green (ICG) dye injection. The learning curve was evaluated using the cumulative sum (CUSUM) technique, with operative time as the quantitative metric to monitor surgeon performance. The number of cases required to overcome the learning curve was determined by visual inspection of the CUSUM plot. Comparisons before and after achieving proficiency were done using an independent samples t test and reported as mean difference with 95% confidence intervals (CIs). A secondary analysis was performed based on segmentectomy complexity. Level of significance was set at $\alpha = 0.05$. **Results:** A total of 177 patients were enrolled in this study; 106 participants (59.9%) underwent the planned intervention with ICG dye. The CUSUM analysis revealed that proficiency was achieved after 62 cases. After the 62nd case, operative time decreased by 17 minutes (95% CI 5.95 to 27.85), and blood loss diminished significantly ($p < 0.001$). Accounting for case complexity, the requirement to achieve proficiency was 29 cases during simple segmentectomy, and 33 cases during complex segmentectomy. Mean operative time was shorter by 21 minutes during simple segmentectomy compared with complex segmentectomy (95% CI –31.42 to –10.40, $p < 0.001$). **Conclusion:** The number of cases required to attain proficiency in NIF-guided segmental resection is estimated to be at 62 cases.

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Routine use of feeding jejunostomy tubes in patients undergoing esophagectomy for esophageal malignancy is safe and associated with low complication rates. ***Emily Mackay, Umeed Fahim, Ajmal Hafizi, Ahmad S. Ashrafi.* From University of British Columbia (Mackay, Ashrafi), the Surrey Thoracic Surgery Group Resarch and Education Department (Fahim, Hafizi), and Surrey Memorial Hospital, Fraser Health (Ashrafi).**

Background: Owing to the morbidity associated with anastomotic leaks in esophagectomies, patients are typically kept "nothing by mouth" postoperatively. Enteral nutrition is achieved via an alternate route initially, often with a feeding jejunostomy tube (J-tube). J-tubes are not without complications, and some centres do not use J-tubes routinely at the time of esophagectomy. Our objective was to review a single surgeon's experience with J-tube use at the time of minimally invasive esophagectomy (MIE) at a high-volume thoracic surgery institute. **Methods:** A review of a prospectively maintained thoracic surgery database of a single surgeon's series was conducted to identify all patients who underwent MIE with J-tube placement between March 2009 and July 2021. Patient factors and operative, and postoperative outcomes were assessed. **Results:** We identified 151 patients who underwent MIE with J-tube insertion during the specified time period. The mean age was 68 years. Most patients were male (80.1%). Mean body mass index was 25.9 kg/m^2 (range 17–43). The primary indication for esophagectomy was malignancy in 146 (96.7%) patients, with 122 (83.6%) receiving neoadjuvant chemoradiation. The main complication surrounding the J-tube was infection in 15 (9.9%) patients. Other complications included dislodged J-tube in 9 (6.0%), broken J-tube in 3 (2.0%), and leaking around the J-tube in 3 (2.0%). No patients required reoperation for J-tube-related complications. Median length of stay was 8 days. Representation to the emergency department following discharge for J-tube complications was seen in 8 (5.3%) patients. Readmission to hospital for J-tube related complications was seen in 4 (2.6%) patients. Median duration of the J-tube was 49 days. **Conclusion:** Our results from a single surgeon's series show that MIE with J-tube placement is a safe and effective procedure for providing patients with postoperative nutrition following esophagectomy. It is associated with low rates of minor complications, presentations to emergency departments, and hospital readmissions.

CANADIAN SOCIETY OF COLON AND RECTAL SURGEONS

01

Ghost ileostomy versus loop ileostomy following total mesorectal excision for rectal cancer: a systematic review and meta-analysis. ***Jay Lee, Tyler McKechnie, Nalin Amin, Aristithes Doumouras, Dennis Hong, Cagla Eskicioglu.* From McMaster University.**

Background: Following total mesorectal excision for low rectal cancer, loop ileostomy (LI) can be used to protect the anastomosis and reduce the consequences of leak. However, diverting ileostomy itself has significant associated morbidity and ileostomy reversal necessitates a second operation. Ghost ileostomy (GI) may reduce the rate of unnecessary loop ileostomy. The aim was to meta-analyze the rate of anastomotic leak and overall

postoperative morbidity from studies comparing LI with GI in rectal cancer resections. **Methods:** MEDLINE, Embase, and CENTRAL databases were systematically searched. Studies investigating the use of GI in rectal cancer alone as well as comparing GI and LI were included. The primary outcomes were the rate of anastomotic leak and postoperative morbidity. Secondary outcomes included stoma-related complication rate and length of stay. Pairwise meta-analyses were performed with inverse variance random effects. **Results:** From 242 citations, 14 studies with 946 patients undergoing total mesorectal excision (TME) for rectal cancer were included. Pairwise meta-analysis revealed no differences in the incidence of anastomotic leak (odds ratio [OR] 1.40, 95% confidence interval [CI] 0.73 to 2.68, $p = 0.31$), overall morbidity (OR 0.76, 95% CI 0.44 to 1.30, $p = 0.32$), or length of stay (standardized mean difference –0.05, 95% CI –0.33 to 0.23, $p = 0.72$) in patients who received GI v. LI. International Study Group of Rectal Cancer anastomotic leak grades were as follows: grade A (GI 0% v. LI 13.3%), grade B (GI 80.9% v. LI 86.7%), grade C (GI 19.1% v. LI 0%). **Conclusion:** GI is a safe alternative to LI following TME for rectal cancer. Larger, prospective comparative studies are warranted to evaluate the use of GI in patients deemed to have low to medium risk of anastomotic leak.

02

Analysis of 100 consecutive colorectal cancers presenting at a Canadian tertiary care centre: delayed diagnosis and advanced disease. ***Kieran Purich, Courtney Streu, Clarence Wong, Dan Schiller*****. From the University of Alberta.**

Background: Colorectal cancer (CRC) accounts for 11% of new cancer diagnoses in Canada. Despite the establishment of screening guidelines and programs, advanced disease at diagnosis is common. The objective of our study was to analyze the clinical pathway for patients with CRC at our centre to understand the reasons for delayed diagnosis. **Methods:** Consecutive patients diagnosed with CRC at our hospital were recruited between Oct. 16, 2020, and July 29, 2021. Patients with a CRC diagnosis before the study start date or recurrent disease were excluded. A questionnaire was completed in person or by phone. **Results:** The study included 100 patients with a median age of 68 ± 13.3 years. The majority of patients (58%) were male, and 25% had a first-degree family history of CRC. Only 26% of cases were identified by screening. Of the screened patients, 81% had stage 0–2 disease, and 5 months following the recruitment of the final patient, none had died. In contrast, 74 patients presented with signs or symptoms including rectal bleeding (26%), anemia (22%) and obstruction (19%). Elective surgery was completed for 36 (49%) of these patients, urgent or emergent surgery for 33 (45%), and 5 (7%) did not receive surgery. Fifty-eight percent of these patients had stage 3 (40%) or 4 (18%) disease. At 5 months of follow-up from the end of recruitment, 18 (24%) of these patients had died. When considering reasons for not receiving screening, 55% of patients in the symptomatic cohort were outside the age range recommended for screening, 22% did not have a family physician and 50% were not offered regular screening. **Conclusion:** Our study confirmed that most patients diagnosed with CRC at our site had not had appropriate screening. These patients presented with advanced disease and had poor outcomes. Increased public awareness and changes to the health care system are needed to increase the proportion of CRC cases diagnosed by screening.

03

Clinical delays and comparative outcomes in younger and older adults with colorectal cancer: a systematic review. ***Matthew Castelo, Colin Sue-Chue-Lam, Lawrence Paszat, Adena Scheer, Bettina Hansen, Teruko Kishibe, Nancy Baxter*****. From the University of Toronto.**

Background: Outcome disparities between adults < 50 years with colorectal cancer (CRC) and older adults may be explained by delays to diagnosis and treatment, but it is unclear if the delay to care differs between these groups. This study synthesized the literature comparing delays and outcomes between younger and older adults with CRC. **Methods:** MEDLINE, Embase, and LILACS databases were searched until December 2021. We included CRC studies published after 1990 reporting delay in adults < 50 years that made any comparison to older adults. Comparisons were described narratively, and stage at presentation between age groups was assessed using a random-effects meta-analysis. **Results:** The search returned 7421 non-duplicated citations; 39 studies were included representing 185 710 younger CRC patients and 1 422 062 older patients. Sixteen unique delay intervals extending from the first clinical presentation to the start of treatment were compared. Fourteen studies (36%) found significantly longer delays among younger adults, 9 (23%) found shorter delays among younger patients, 2 (5%) showed mixed findings, and 4 studies (36%) found no significant differences. Ten studies compared time from diagnosis to treatment (younger $n = 171\,726$). Four showed significantly shorter delays for younger adults and none showed longer delays for these patients. All studies showing longer delays for younger adults examined prediagnostic intervals. Three studies compared the impact of delay on younger v. older adults. One showed longer delays were associated with advanced stage and worse survival in younger but not older adults. The remaining 2 studies showed no adverse impact of delays for either age group. Sixteen studies compared stage at presentation by age. Younger age was associated with significantly higher odds of advanced stage at presentation (pooled odds ratio for Stage III/IV 1.76, 95% confidence interval 1.52–2.03). **Conclusion:** Longer delays among younger adults with CRC occur in prediagnostic intervals. Interventions to decrease delay in younger adults should focus on this period.

04

Recurrence rates of rectal cancer after transanal total mesorectal excision (taTME): a systematic review and meta-analysis. ***Antonio Caycedo-Marulanda, Emma Neary, Tarek Ibrahim, Chris Verschoor, Sunil Patel, Shaila Merchant, Sami Chadi, Luis Romagnolo*****. From Queen's University (Caycedo-Marulanda, Neary, Patel, Merchant), University of Toronto (Ibrahim, Chadi), Health Sciences North Research Institute (Verschoor), and IRCAD Brazil (Romagnolo).**

Background: Transanal total mesorectal excision (taTME) has been offered as an alternative to overcome the technical limitations of the traditional approaches for rectal cancer. Hesitancy exists in the surgical community owing to conflicting data on local recurrence after the issuance of a local moratorium in Norway. Conflicting findings underscored the need for studies with larger sample sizes and longer follow-up periods. To systematically review all case series, comparative studies and trials to date, with the primary outcome of determining the rate of local recurrence (LR) following taTME and subsequent comparison to that of laparoscopic and open TME for rectal cancer. **Methods:** Experimental and clinical studies involving patients who underwent taTME surgery for rectal adenocarcinomas between 2008 and 2021 were obtained/searched via PubMed, MEDLINE via Ovid, Embase classic + Embase, Cochrane Central Register of Controlled Trials, Web of Science Core Collection, CINAHL and ProQuest Dissertations and Theses Global. Retrieved studies were screened, critically appraised, and a narrative synthesis and meta-analysis of eligible articles conducted. **Results:** Forty-seven (4%) of 1175 studies identified were included in the final analysis; all were either retrospective or prospective observational cohort studies. LR was identified either via radiologic, endoscopic or surgical assessment and possibly with histologic confirmation following primary tumour resection. Pooled estimates using a fixed-effects model for LR following taTME were 3.6% across studies with follow-up periods ranging from 0.7 to 5.5 years. An estimate for LR rate in conventional (laparoscopic) TME was similar at 4.1%. **Conclusion:** Pooled estimates suggest no significant differences in the LR rate following taTME v. conventional laparoscopy. Positive circumferential resection margin and advanced disease are significant risk factors for disease recurrence. Additional confounding factors in recently published studies may include the use of data from multiple surgeons performing very few cases of taTME and data solely derived from centres in the implementation stage ($n < 10$ cases) of the learning curve.

05

Transanal total mesorectal excision for abdominoperineal resection (taTME-APR) is associated with poor oncological outcomes in rectal cancer patients: a word of caution from a multicentric Canadian cohort study. ***Antonio Caycedo-Marulanda*, *Chris Verschoor*, *Carl Brown*, *Ahmer Karimuddin*, *Manoj Raval*, *Terry Phang*, *Elena Vikis*, *George Melich*, *Sunil Patel*. From Queen's University (Caycedo-Marulanda, Patel), Health Sciences North Research Institute (Verschoor), and University of British Columbia (Brown, Karimuddin, Raval, Phang, Vikis, Melich).**

Background: Principles of total mesorectal excision (TME) entail procuring a complete specimen and avoidance of positive circumferential margins. Patients receiving an abdominoperineal resection (APR) have historically experienced worse oncological outcomes than those undergoing a low anterior resection (LAR); nevertheless, this does not necessarily represent more aggressive biology, but instead the consequence of technical challenges associated with the narrowness of the pelvis, bulkiness of the tumour/mesorectum, tapering of the distal rectum and the "waist" configuration of the anorectal junction. The main objective of this study was to compare the oncological outcomes of patients undergoing APR v. LAR through a transanal TME (taTME) approach. **Methods:** A total of 360 adult patients with a diagnosis of rectal cancer were enrolled at participating centres from the Canadian taTME Expert Collaboration; 43 patients received taTME-APR v. 317 taTME-LAR. Demographic, operative, pathologic, and follow-up data were collected and merged into a single database. Results are presented as hazard ratios (HRs) and 95% confidence intervals (CIs). All analyses were performed in the R environment (v3.6). **Results:** The proportion of patients with a positive circumferential resection margin status was higher in the taTME-APR group than the taTME-LAR group (21% v. 9%, $p = 0.001$). Complete TME was achieved in 91% of those undergoing APR v. 96% of those undergoing LAR ($p = 0.25$). APR was associated with a greater rate of local recurrence than LAR, although it was not significant (crude HR 3.53, 95% CI 0.92–13.53). Circumferential margin positivity was significantly associated with a higher rate of systemic recurrence (crude HR 3.59, 95% CI 1.38–9.3) **Conclusion:** Our results demonstrate inferior outcomes in those undergoing taTME-APR compared with taTME-LAR. The use of this technique for this particular indication needs to be carefully considered.

06

Association between survival and receipt of recommended and timely treatment in locally advanced rectal cancer: a population-based study. ***Kelly Brennan*, *Sunil Patel*, *Antonio Caycedo-Marulanda*, *Shaila Merchant*, *Christopher Booth*, *Weidong Kong*, *Chad McClintock*, *Clare Bankhead*, *Carl Heneghan*. From Queen's University (Brennan, Patel, Caycedo-Marulanda, Merchant, Booth, Kong, McClintock) and University of Oxford (Bankhead, Heneghan).**

Background: Individuals with locally advanced rectal cancer require multimodality treatment, including radiation, chemotherapy and surgery. Lack of recommended and timely treatment may lead to worse outcomes. We sought to determine the association between receipt of recommended and timely treatment and survival. **Methods:** This population-based study included individuals with stage 2 and 3 rectal cancer in Ontario, Canada, between 2010 and 2019. Patients were identified using the provincial cancer registry. Using linked administrative databases, we captured patient, provider and treatment details. Provincial guidelines were used to determine the receipt of recommended and timely treatment, including 1) initiating radiation within 28 days of completion of staging, 2) receiving surgery within 12 weeks of radiation completion, and 3) receiving adjuvant chemotherapy within 16 weeks of surgery completion. Multivariable logistic regression was conducted to assess for factors associated with receipt of recommended and timely care. Cox proportional hazard models were used to explore associations between receipt of such care and survival. **Results:** A total of 6688 individuals were identified (37% females, mean age of 65 ± 13 years); 2626 (38%) received recommended treatment, while 1356 (20%) received recommended and timely treatment. The following factors were found to be associated with recommended and timely treatment on adjusted analyses: younger age group, treatment at a regional cancer centre, increasing surgeon volume and few comorbidities ($p < 0.05$). After adjusting for age, sex, comorbidities, socioeconomic status, surgeon volume, and hospital type, we found inferior survival in those

who did not receive recommended and timely treatment (hazard ratio 1.54, 95% confidence interval 1.26–1.87). **Conclusion:** Receipt of timely and recommended care is associated with improved survival. We identified that care provided by high-volume surgeons and at regional cancer centres was associated with increased odds of receipt of timely, recommended treatment.

07

Trends and the impact of incomplete preoperative staging in rectal cancer. ***Kelly Brennan*****,** ***Sunil Patel*****,** ***Chad McClintock*****,** ***Shaila Merchant*****,** ***Antonio Caycedo-Marulanda*****,** ***Christopher Booth*****,** ***Clare Bankhead*****,** ***Carl Heneghan*****. From Queen's University (Brennan, Patel, McClintock, Merchant, Caycedo-Marulanda, Booth) and University of Oxford (Bankhead, Heneghan).**

Background: Individuals with rectal cancer require several pretreatment investigations to determine the local–regional and overall stage of disease. Stage of cancer determines the treatment plan. We sought to evaluate how inadequate staging may compromise care and outcomes. **Methods:** This population-based study included individuals undergoing surgical resection for rectal cancer in Ontario, Canada, between 2010 and 2019. Patients were identified in the provincial cancer registry. Complete staging in rectal cancer has previously been defined and includes assessments of distant metastasis, local–regional stage and a colonic assessment for synchronous lesions. Patient and care provider characteristics, staging investigations, stage of disease, treatments and long-term outcomes were determined using linked administrative databases. **Results:** We included 10 957 individuals with rectal cancer; 24% stage I, 21% stage II, 40% stage III, 7% stage IV, 8% unknown. Mean age was 65 ± 12.6 years and 37% were females. Incomplete staging was reported in one-quarter, with incomplete local–regional staging as the predominant deficiency (21%). Increasing age ($p < 0.001$), and low-volume surgeons ($p < 0.001$) and hospitals ($p < 0.001$) were associated with incomplete staging. There was significant regional variation in completeness of staging (range 68%–84%). Among those with locally advanced rectal cancer (stage II/III), incomplete staging was associated with lower rates of preoperative radiation oncology referrals (27% v. 80%, $p < 0.001$) and medical oncology referrals (15% v. 56%, $p < 0.001$). Incomplete staging was associated with lower rates of any radiation (pre- or postoperative) (45% v. 82%, $p < 0.001$), lower rates of preoperative therapy (22% v. 74%, $p < 0.001$) and higher rates of postoperative radiation (23% v. 8.3%, $p < 0.001$). Those with incomplete staging had a lower 5-year overall survival (73% v. 81%, $p < 0.001$). **Conclusion:** We identified several modifiable risk factors for incomplete staging before treatment for rectal cancer. Incomplete staging resulted in suboptimal care, as demonstrated by fewer oncology referrals, decreased use of preoperative therapy and lower survival.

08

Postoperative outcomes after elective colorectal surgery in patients with cirrhosis. ***Kelly Brennan*****,** ***Lisa Zhang*****,** ***Jennifer Flemming*****,** ***Maya Djerboua*****,** ***Sulaiman Nanji*****,** ***Antonio Caycedo-Marulanda*****,** ***Shaila Merchant*****,** ***Sunil Patel*****. From Queen's University.**

Background: Patients with cirrhosis have significant postoperative risks following major abdominal surgery. Historic literature and prediction tools do not reflect current practices, experiences and outcomes. We sought to describe postoperative outcomes in patients with cirrhosis after elective colorectal surgery. **Methods:** This retrospective cohort study included individuals in Ontario (population 14 million) with a diagnosis of cirrhosis. Individuals who underwent elective major colorectal surgery between 2009 and 2017 were included. Baseline characteristics, cirrhosis-specific characteristics, and outcomes were identified using linked administrative databases. Univariable and multivariable analysis was completed. **Results:** During the study period, 1439 patients were identified (41% female, mean age 65 yr). The Model for End-Stage Liver Disease-Na (MELD-Na) score was available in 42% of individuals, with a median of 8 (interquartile range 7–11). The most common cirrhosis etiologies were nonalcoholic fatty liver disease (58%) and alcohol-related (24%). Indications for surgery included colorectal cancer (70%), followed by diverticulitis (11%) and inflammatory bowel disease (10%). The 3 most common procedures performed were colon resection with primary anastomosis (66%), rectal resection with primary anastomosis (17%), and abdominal perineal resection (6%). The 90-day mortality was 7%. The average total length of hospital stay was 11 days. Assessed 90-day complications included readmission to hospital after discharge (23%), emergency department visit (37%), unplanned intensive care unit admission (6%) and hepatic decompensation (6%). Ninety-day mortality based on MELD-Na score included 5% in those with a score ≤ 9; 15% in those with a score of 10–19; and 36% with a score ≥ 20. **Conclusion:** This work confirms that the surgical risks are lower than once believed in patients with cirrhosis undergoing colorectal surgery in the elective setting. This evidence will guide management of patients in this high-risk group.

09

Bowel stimulation before loop ileostomy closure to reduce postoperative ileus: a multicentre, single-blinded, randomized controlled trial. ***Richard Garfinkle*****,** ***Marie Demian*****,** ***Sarah Sabboobeh*****,** ***Jeongyoon Moon*****,** ***Michael Hulme-Moir*****,** ***A. Sender Liberman*****,** ***Stan Feinberg*****,** ***Dana M. Hayden*****,** ***Sami A. Chadi*****,** ***Sebastian Demyttenaere*****,** ***Louise Samuel*****,** ***Nevart Hotakorzian*****,** ***Laurence Quintin*****,** ***Nancy Morin*****,** ***Gabriela Ghitulescu*****,** ***Julio Faria*****,** ***Carol-Ann Vasilevsky*****,** ***Marylise Boutros*****. From Jewish General Hospital (Garfinkle, Demian, Sabboobeh, Moon, Samuel, Hotakorzian, Quintin, Morin, Ghitulescu, Faria, Vasilevsky, Boutros), North Shore Hospital (Hulme-Moir), McGill University Health Centre (Liberman), North York General Hospital (Feinberg), Rush University Medical Center (Hayden), University Health Network (Chadi), and St. Mary's Hospital (Demyttenaere).**

Background: Postoperative ileus (POI) is the most common morbidity following loop ileostomy closure and is a major impediment to early discharge protocols. The objective of this study was to evaluate the impact of preoperative bowel stimulation on the development of POI after loop ileostomy closure. **Methods:** This was a multicentre, randomized controlled

trial (NCT025596350) including adult (≥ 18 yr old) patients who underwent elective loop ileostomy closure at 7 participating hospitals. Participants were randomly assigned (1:1) using a centralized computer-generated sequence with block randomization to either preoperative bowel stimulation or no stimulation (control group). Bowel stimulation consisted of 10 outpatient sessions within 3 weeks before ileostomy closure and was performed by trained enterostomal therapy nurses. The primary outcome was POI, defined as an intolerance to oral food in the absence of clinical or radiological signs of obstruction, on or after postoperative day 3, that either required nasogastric tube insertion or was associated with 2 of the following: nausea/vomiting, abdominal distension, or the absence of flatus. **Results:** Between January 2017 and November 2020, 101 patients were randomized, and 5 patients never underwent ileostomy closure; thus, 96 patients (47 stimulated v. 49 control) were analyzed according to a modified intention-to-treat protocol. Baseline characteristics were well balanced in both groups. The incidence of POI was lower among patients randomized to stimulation (6.4% v. 24.5%, p = 0.034; unadjusted relative risk 0.26, 95% confidence interval 0.078–0.87). Stimulated patients also had earlier median time to first flatus (2.0 d [range 1.0–2.0] v. 2.0 d [range 2.0–3.0], p = 0.025), were more likely to pass flatus on postoperative day 1 (46.8% v. 22.4%, p = 0.022), and had a shorter median postoperative hospital stay (3.0 d [range 2.0–3.5] v. 4.0 d [range 2.0–6.0], p = 0.003). **Conclusion:** Preoperative bowel stimulation via the efferent limb of the ileostomy reduced POI after elective loop ileostomy closure.

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Recurrence following perineal rectosigmoidectomy (Altemeier) with levatorplasty: a systematic review and meta-analysis. ***Sahil Sharma, Tyler Mckechnie, Jigish Khamar, Simarpreet Ichhpuniani, Cagla Eskicioglu.*** **From McMaster University.**

Background: Full-thickness rectal prolapse is associated with significant morbidity and remains a challenging pathology to correct surgically with significant recurrence rates. Among perineal surgical approaches, the perineal rectosigmoidectomy, commonly referred to as the Altemeier procedure, is the most frequently performed. The addition of levatorplasty has been postulated to improve recurrence rates; however, its efficacy varies across prospective studies. The aim of this study was to systematically review recurrence rates following Altemeier with levatorplasty, and to meta-analyze pooled data comparing recurrence rates between Altemeier with and without a levatorplasty. **Methods:** A search of Embase, Ovid MEDLINE, and CENTRAL was performed from database inception to October 2021 aimed at identifying all studies investigating recurrence rate of rectal prolapse following Alteimer with levatorplasty. The primary end point was recurrence of rectal prolapse. Articles that did not report the primary end point or did not evaluate Altemeir procedure with levatorplasty were excluded. A pairwise meta-analysis was performed using Mantel–Haenszel random effects. **Results:** From 200 citations, a total of 14 primary studies met inclusion criteria. A total of 620 patients (88.9% female, mean age 71 yr) underwent Altemeier with levatorplasty. Of the patients undergoing levatorplasty, 86 (13.8%) experienced a recurrence. Mean follow-up was 46 months. Meta-analysis of recurrence rates between Altemeier with and without levatorplasty demonstrated no significant difference (relative risk 0.92, 95% confidence interval 0.32–2.59, p = 0.87, I^2 = 77%). **Conclusion:** Narrative review of postoperative quality of life metrics demonstrated an improvement in incontinence following Altemeier with levatorplasty as measured by the Wexner and ICIQ-SIF scores. The addition of a levatorplasty does not significantly reduce the risk of recurrent rectal prolapse after an Altemeier; however, it may improve incontinence. Additional randomized controlled trials with standardized surgical techniques are needed to confirm the findings of this review.

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Nonmodifiable risk factors and receipt of surveillance investigations following treatment of rectal cancer. ***Sydney Candy, Sunil Patel, Shaila Merchant, Antonio Caycedo-Marulanda, Clare Bankhead, Carl Heneghan.*** **From University of Alberta (Candy), Queen's University (Patel, Merchant, Caycedo-Marulanda), and University of Oxford (Bankhead, Heneghan).**

Background: Despite improved outcomes in the treatment of rectal cancer, up to 35% of patients treated for cure experience local–regional or distant recurrences. The receipt of regular surveillance following treatment for rectal cancer allows for earlier identification and possible treatment of metastatic or recurrent disease. The objective of this review was to determine if age, gender and ethnicity were associated with the receipt of recommended surveillance recommendations in patients with rectal cancer. **Methods:** Embase and MEDLINE databases were searched for studies published between 2000 and 2020 that examined the association between age, gender, and ethnicity and recommended surveillance investigations (including colonoscopy, carcinoembryonic antigen, computed tomography or magnetic resonance imaging, and clinical assessment). The Newcastle–Ottawa Scale was used for assessing the quality of nonrandomized studies, and a meta-analysis was attempted where study data were sufficient. **Results:** Fifteen retrospective cohort studies were included in this review. All studies were retrospective cohort studies and included between 60 and 38 000 patients. All included studies grouped colon and rectal cancer patients together. This analysis found no association between gender and adherence to overall surveillance recommendations (odds raio 1.04, 95% confidence interval 0.79–1.35, I^2 = 86.6%). Eight studies found that there was an association with increasing age, especially for those older than 75 or 80 years, and decreased use of surveillance colonoscopy. Four studies found that Black ethnicity was associated with lower adherence to surveillance colonoscopy. Of those studies, factors such as geography and median household income in patients' neighbourhood played a role in receipt of colonoscopy. Patients with intensive surveillance were more likely to undergo an attempt at surgical resection. **Conclusion:** Among the potential barriers of age, gender, and ethnicity to guide recommended surveillance in rectal cancer patients, there is a clear association with increased age and non-white ethnicity in some surveillance modalities.

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Safety and effectiveness of endoscopic full-thickness resection for the management of colorectal lesions: a systematic review and meta-analysis. ***Tyler McKechnie, Shaylan Govind, Jay Lee, Yung Lee, Dennis Hong, Cagla Eskicioglu.*** **From McMaster University.**

Background: Endoscopic full-thickness resection (EFTR) is a relatively new technique for the resection of colorectal lesions. Multiple centres have published the results of case series and observational cohorts regarding the use of this technique. This study aimed to aggregate the results of these studies to determine the effectiveness and safety of this technique in the resection of colonic lesions. **Methods:** Search of MEDLINE, Embase, and CENTRAL databases was performed. Articles were included if they reported a technical success rate for EFTR of colonic lesions. The primary outcome was technical success rate and secondary outcomes included rate of R0 resection and overall 30-day morbidity. Systematic narrative summaries were provided for each outcome. DerSimonian and Laird random-effects meta-analysis of proportions was used to generate effect sizes for pooled outcomes. **Results:** From 2211 citations, 22 observational studies with 1558 patients (mean age 67.1 yr, 41.0% female) undergoing 1570 procedures were included. High-risk benign lesions were the most common excised lesions (hyperplastic: 37%; adenomas: 30%), followed by T1 adenocarcinomas (26%) and neuroendocrine tumours (6%). Technical success rate was 94% (95% confidence interval [CI] 91%–96%), R0 resection rate was 85% (95% CI 80%–89%). Mean procedure time was 54 minutes. Overall 30-day morbidity was 10% (95% CI 7%–13%), incidences of perforation and postpolypectomy bleeding were 1% (95% CI 0%–1%) and 3% (95% CI 1%–5%), respectively. **Conclusion:** EFTR is a safe and effective technique with high rates of technical success and R0 resection when employed by experienced endoscopists for high-risk colonic lesions. Its use, however, should likely be limited to lesions < 20 mm in size and in institutions with high-volume endoscopic and colorectal expertise with the capabilities of managing both the intraprocedure challenges and postprocedure complications for the time being. Further comparative study between EFTR, endoscopic mucosal resection, and endoscopic submucosal dissection for specific subsets of colonic lesions is required to delineate lesions most likely to benefit from this approach.

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Impact of preoperative carbohydrate loading before colectomy: a systematic review and meta-analysis of randomized controlled trials. ***Tyler McKechnie, Justin Lu, Jigish Khamar, Yung Lee, Nalin Amin, Dennis Hong, Cagla Eskicioglu.*** **From McMaster University.**

Background: Traditionally, patients fasted 8h before elective operations to minimize risk of aspiration. Recently, this has been challenged in Enhanced Recovery After Surgery (ERAS) protocols, which suggest the avoidance of preoperative fasting and promote carbohydrate loading up to 2h preoperatively. While there are increasing randomized controlled trial (RCT) data evaluating the use of preoperative carbohydrate loading, synthesis of data pertaining specifically to colorectal surgery has yet to be performed. This meta-analysis aimed to compare patients receiving preoperative carbohydrate loading to those receiving a control before colorectal surgery. **Methods:** MEDLINE, Embase, and CENTRAL were searched. Articles were eligible for inclusion if they were RCTs comparing patients undergoing colorectal surgery receiving and not receiving preoperative carbohydrate loading. Primary outcomes were changes in blood glucose and insulin levels. Secondary outcomes included length of stay (LOS), time to first flatus and stool, and postoperative morbidity. A pairwise meta-analysis using inverse variance random effects was performed. **Results:** The search yielded 3656 citations, from which 12 RCTs were included. In total, 387 patients given preoperative carbohydrate loading (47.2% female, mean age 62.0 yr) and 371 controls (49.4% female, mean age 61.1 yr) were included. There was no significant difference in postoperative blood glucose and insulin levels between groups. Patients receiving preoperative carbohydrate loading experienced a shorter time to first flatus (standardized mean difference [SMD] –0.48 d, 95% confidence interval [CI] –0.84 to –0.12, p = 0.008) and stool (SMD –0.50 d, 95% CI –0.86 to –0.14, p = 0.007). LOS was shorter in the preoperative carbohydrate loading group (SMD –0.51 d, 95% Cl –0.88 to –0.14, p = 0.007). There was no difference in postoperative morbidity between the groups. **Conclusion:** Preoperative carbohydrate loading does not significantly impact postoperative glycemic control in patients undergoing colorectal surgery; however, it may allow for a shorter LOS and faster return of bowel function. It merits inclusion within colorectal ERAS protocols.

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Statin therapy in patients undergoing short-course neoadjuvant radiotherapy for rectal cancer. ***Tyler McKechnie, Luisa Cardenas, Daniel Schep, Aristithes Doumouras, Dennis Hong, Raimond Wong, Oren Levine, Cagla Eskicioglu.*** **From McMaster University.**

Background: There is a potential benefit with concurrent statin use and neoadjuvant therapy for rectal cancer. No study to date has examined the impact of statins on short-course neoadjuvant radiation. This study aimed to elucidate the impact of concurrent statin use on response to short-course neoadjuvant radiation. **Methods:** This was a retrospective cohort study that included all patients with stage II or III rectal cancer receiving short-course neoadjuvant radiation for rectal adenocarcinoma between 2014 and 2020. Patients were excluded if they had metastatic disease, recurrent disease, total neoadjuvant therapy (TNT), or oncologic resection < 6 weeks after completing neoadjuvant therapy. Primary outcome was incidence of pathologic complete response (pCR). Secondary outcomes included graded pathologic response and incidence of radiation-associated toxicity. Univariable logistic regressions and stepwise multivariable logistic regressions were performed for primary and secondary outcomes. **Results:** Seventy-nine patients (mean age 68.6 ± 11.2 yr, 39.2% female) met inclusion criteria. Prior to neoadjuvant therapy, median T-stage was 3 (range 1–4), median N-stage was 1 (range 0–2), and mean tumour distance from the anal verge was 6.3 cm ± 2.9 cm. Thirty-five patients (44.3%) were using statins at the

time of neoadjuvant therapy. Overall, 7.6% experienced pCR. Conversely, 29.1% did not have treatment response on pathology. Radiation-associated toxicity occurred in 43.0%. Statin use was not associated with increased pCR (odds ratio [OR] 2.71, 95% confidence interval [CI] 0.47–15.7, $p = 0.27$); however, it was associated with a significantly lower incidence of no response (OR 0.33, 95% CI 0.11–0.96, $p = 0.04$). On stepwise multivariable logistic regression, statin use (OR 0.08, 95% CI 0.01–0.43, $p = 0.003$) was associated with decreased incidence of no response. **Conclusion:** Statins may offer a synergistic effect when given concurrently with short-course neoadjuvant radiation for rectal cancer. Further prospective study evaluating the use of statins in conjunction with neoadjuvant short-course radiation, especially within the context of TNT, is warranted.

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Feasibility of targeted lymphadenectomy during complete mesocolic excision for colon cancer using indocyanine green immunofluorescence lymphatic mapping. ***Lawrence Lee, Carmen Mueller, Barry Stein, Patrick Charlebois, Sender Liberman, Gerald Fried, Liane Feldman.*** **From McGill University Health Centre.**

Background: Higher nodal harvest is associated with better oncologic outcomes for colon cancer, but lymphatic drainage of the colon is variable. Intraoperative identification of the lymphatic drainage patterns using indocyanine green (ICG) immunofluorescence may allow tailored lymphadenectomy during complete mesocolic excision (CME). The objective was to determine the feasibility of ICG immunofluorescence for lymphatic mapping (ICG-LM) and its effect on nodal status in right-sided colon cancer. **Methods:** A prospective cohort study was performed at a single university-affiliated colorectal specialist centre from December 2018 to June 2021. Patients with biopsy-proven bulky (defined as visible tumour or pericolonic lymphadenopathy on preoperative scan) adenocarcinoma proximal to the mid-transverse were approached for participation and underwent ICG-LM or standard CME. The ICG-LM procedure involved peritumoral injection of 4 × 0.5 mL of ICG (25 mg/10 mL) at the beginning of the operation and immunofluorescence imaging of the lymphatic drainage basins 20 minutes postinjection. CME with central vascular ligation (CVL) of the identified drainage basins was performed in the ICG-LM group. In the standard CME group, tumour-specific CVL was performed. The main outcomes were feasibility (did ICG drain into lymphatic system?), total lymph node harvest, and the incidence of nodal involvement. **Results:** Forty patients were included in this study (ICG-LM $n = 20$; standard CME $n = 20$). For proximal lesions the middle colics underwent CVL in 1 of 5 patients in the ICG-LM group. For more distal lesions, CVL of the middle colics was avoided in 8 of 15 patients. The incidence of nodal involvement was 30% in both groups ($p = 1.00$). The total lymph node harvest was higher in the ICG-LM group. The number of positive nodes, D3 nodes, and proportion with positive D3 nodes were similar. **Conclusion:** Lymphatic mapping using ICG immunofluorescence for colon cancer is feasible and may increase the total nodal harvest but did not affect the proportion of patients in our study with node-positive disease. Any potential oncologic benefit would have to derive from a higher lymph node harvest.

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Feasibility of expanding an ambulatory colectomy protocol: a retrospective analysis of early discharge following minimally invasive colectomy in an enhanced recovery pathway. ***Stephan Robitaille, Anna Wang, Sender Liberman, Patrick Charlebois, Barry Stein, Julio F. Fiore Jr., Liane Feldman, Lawrence Lee.*** **From McGill University.**

Background: There is increasing evidence to support discharge before gastrointestinal recovery following colorectal surgery. Furthermore, many patients are discharged early despite being excluded from an ambulatory colectomy pathway. The objective of this study was to determine the outcomes of patients discharged early following laparoscopic colectomy in an enhanced recovery pathway (ERP). **Methods:** A retrospective review of all adult patients undergoing elective laparoscopic colectomy at a single university-affiliated colorectal referral centre (August 2017 to June 2021) was performed. Patients were included if they had undergone elective laparoscopic colectomy or ileostomy closure and excluded if they had been enrolled in an ambulatory colectomy pathway. Patients were then divided into 3 groups: length of stay (LOS) 1 day, LOS 2–3 days, and LOS ≥ 4 days. The main outcomes were 30-day emergency department (ED) visits, and readmissions. Reasons for inpatient stay per postoperative day (POD) were also recorded. **Results:** A total of 497 patients were included (LOS 1: $n = 63$, 13%; LOS 2–3: $n = 284$, 57%; LOS ≥ 4: $n = 150$, 30%). There were no differences in patient characteristics, diagnosis, or procedure between the groups. Patients were discharged with gastrointestinal recovery (GI-3) in 54% LOS 1 v. 98% LOS 2–3 v. 100% LOS ≥ 4 ($p < 0.001$). Shorter procedure duration, transversus abdominus plane block, and lower opioid requirements were associated with shorter LOS ($p < 0.001$). Absence of flatus was the most common reason to keep patients hospitalized: 61% on POD 1, 21% on POD 2, and 8% on POD 3 ($p < 0.001$). There were no differences in 30-day ED visits or readmission between the groups. In the LOS 1 group, there were no differences in outcomes between patients with full return of bowel function at discharge compared with those without. **Conclusion:** Discharge on POD 1 was not associated with increased ED use, complications or readmissions. Importantly, full return of bowel function at discharge did not affect outcomes. There may be potential to expand eligibility criteria for ambulatory colectomy protocol.

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Impact of rectal cancer on bowel dysfunction before treatment and its relationship with post-treatment function. ***Stephan Robitaille, Anna Wang, Sender Liberman, Patrick Charlebois, Barry Stein, Julio F. Fiore Jr., Liane Feldman, Lawrence Lee.*** **From McGill University.**

Background: Rectal cancer treatments can cause significant bowel dysfunction (BD), and the decision for sphincter preservation or permanent colostomy often depends on baseline function. However, there are few data on pretreatment function, and there is a high proportion of the general population that have baseline BD. Therefore, we sought to evaluate pretreatment bowel function and its relationship with posttreatment function.

Methods: A prospective functional outcomes database of adult patients evaluated for new primary rectal cancer at a single university-affiliated colorectal referral centre from August 2018 to December 2021 was queried. Patients were excluded if they received any treatment before their consultation. Bowel function was measured using the Low Anterior Resection Syndrome (LARS) score before treatment and ≥ 6 months following restoration of bowel continuity. Patients were categorized as no, minor, and major LARS. Predicted LARS scores were obtained from published normative data for age and sex. **Results:** Overall, 94 patients were included (mean age 61.8 ± 11.9 yr, 74% male, mean tumour height 8.4 ± 5.3 cm, size 3.7 ± 2.2 cm). Mean observed LARS score was 18.1 ± 13.1, with 46% categorized as no, 31% minor, and 22% major LARS. Male sex and high-risk age group was associated with worse than predicted LARS categories. Tumour size (β + 2.1 per cm, 95% confidence interval [CI] 0.7 to 3.5) and tumour height (β –0.6, 95% CI –1.2 to –0.1) were independently associated with a larger mean difference between observed and predicted LARS. In the 63 patients with postsurgery LARS scores, LARS improved in 13% (95% CI 4% to 21%), worsened in 33% (95% CI 21% to 45%) and remained unchanged in 54% (95% CI 42% to 66%) following treatment. There were significantly more patients with major LARS posttreatment compared with pretreatment. **Conclusion:** Pretreatment BD in rectal cancer patients can be significantly worse than normative values and largely does not improve after treatment. This suggests that patients' pretreatment bowel function can be used to predict postsurgical function and may aid in the decision-making process regarding sphincter preservation v. permanent colostomy.

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Canadian cost–utility analysis of artificial-intelligence-assisted colonoscopy for adenoma detection in fecal immunochemical-based colorectal cancer screening. ***Hamid Sadri*****,** ***Alan Barkun*****. From Medtronic (Sadri), McGill University (Barkun), and McGill University Heatlh Centre (Barkun).**

Background: Approximately 25% of interval colorectal cancers arise from undetected adenomas. Randomized clinical trials demonstrated that artificial intelligence (AI)-assisted colonoscopy using the GI-Genius technology significantly improves adenoma detection. The goal of this study was to characterize the cost-effectiveness of GI-Genius in Canadian health care. **Methods:** An Excel-based Markov model with 1-year cycles and a lifetime horizon was used to estimate the incremental cost-effectiveness ratio (ICER) comparing conventional to Al-assisted colonoscopy polyp detection. The target population comprised patients who would undergo colonoscopy after a positive fecal immunochemical test (FIT). The clinical outcomes were life years (LYs) gained and quality-adjusted life years (QALYs). The analysis used direct costs associated with health care resource utilization (HCU), including procedures (diagnostic, surgery), therapy (chemotherapy), and follow-ups from a provincial government payer perspective expressed in 2021 dollars, discounted at 3.5%. Outcomes and costs were sourced from the published literature and provincial databases. Probabilistic and deterministic sensitivity analyses (SAs) were performed to assess robustness of the model. **Results:** In the base-case analysis, where 1000 colonoscopies were performed yearly, the LYs gained in the AI-assisted and conventional colonoscopy groups were 19.144 and 19.125 (difference 0.019), respectively. The QALY gained for AI-assisted and conventional colonoscopy were 17.137 and 17.113 (difference 0.024), respectively. The per-case cost of AI-assisted and conventional colonoscopies were $3004.59 and $2990.74, respectively (saving about $14). With a willingness-to-pay threshold of $50 000/QALY, the ICER was dominant for both outcomes, showing that the GI-Genius is cost-effective. The deterministic SA showed that the model is sensitive to the incidence risk ratio of adenoma per colonoscopy for larger adenomas as the main cost driver. The probabilistic SA showed that the AI-assisted strategy was cost-effective in 73.4% of the cases. **Conclusion:** The addition of GI-Genius to colonoscopy is a cost-effective strategy for improving adenoma detection in FIT-positive patients in the Canadian health care system.

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A comparison of outcomes following intracorporeal and extracorporeal anastomotic techniques in laparoscopic right colectomies. ***Sydney Selznick*****,** ***Jordan Levy*****,** ***Ruxandra Bogdan*****,** ***Jeffrey Hawel*****,** ***Ahmad Elnabas*****,** ***Nawar A. Alkhamesi*****,** ***Christopher M. Schlachta*****. From Western University.**

Background: Anastomotic technique in laparoscopic right colectomy may be extracorporeal (ECA) or intracorporeal (ICA). ECA requires intestinal exteriorization through an upper- or mid-abdominal incision, with associated mesenteric traction, whereas ICA avoids this manoeuvre and utilizes a smaller, lower-abdominal incision purely for extraction. Thus, ICA may be associated with fewer wound complications, shorter length of stay, and decreased hernia formation. We looked to compare short- and long-term outcomes for these 2 techniques. **Methods:** All adult patients who underwent laparoscopic right colectomy between 2015 and 2020 at a single institution were included. ICA and ECA techniques were compared based on selected outcomes using univariable and multivariable statistical analyses as appropriate. Subgroup analyses were restricted to elective operations and neoplastic indications. **Results:** In total, 517 patients met inclusion criteria; 139 (26.9%) underwent ICA and 378 (73.1%) underwent ECA. Baseline characteristics were similar in ICA and ECA groups. Median operative time was longer for ICA (186 min v. 135 min, $p < 0.001$). Ninety-day unscheduled visits, readmissions, and mortality were similar across both groups, as were oncologic outcomes. Superficial wound infections, anastomotic leaks, and reinterventions occurred less frequently in ICA patients, without a statistically significant difference. Median length of stay was 1 day shorter in the ICA group (3 d v. 4 d, $p = 0.007$), and ICA was associated with a 13% decrease in length of stay (adjusted risk ratio 0.87, $p = 0.02$). A lower proportion of ICA patients developed a hernia at the extraction incision at 2 years of follow-up (1.5% v. 7.1%, $p = 0.02$), and ICA was associated with an 80% reduction in extraction incision hernias (adjusted hazard ratio 0.20, $p = 0.03$). These results remained stable through subgroup and sensitivity analyses. **Conclusion:** Intracorporeal anastomosis in laparoscopic right colectomy is associated with shorter length of hospital stay and a reduced risk of incisional hernia without risking patient safety or oncologic principles.

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Assessment of metabolic signatures using desorption electrospray ionization mass spectrometry (DESI) and rapid evaporative ionization mass spectrometry (REIMS) of rectal cancer samples to assist in determining treatment response. ***Vanessa Wiseman, Antonio Caycedo-Marulanda, Natasha Iaboni, David Hurlbut, Martin Kaufmann, Kevin Yi Mi Ren, Amoon Jamzad, Parvin Mousavi, Gabor Fichtinger, Christopher J.B. Nicol, John F. Rudan.*** **From Queen's University.**

Background: The purpose of this study was to identify new techniques that can determine metabolic signatures in patients who will successfully respond to neoadjuvant chemoradiation. We used desorption electrospray ionization mass spectrometry (DESI) and rapid evaporative ionization mass spectrometry (REIMS) to identify tissue metabolites in cancerous cells that can respond to chemoradiation. **Methods:** This was a prospective study of patients with rectal cancer (with no previous treatment) using tissue biopsies obtained from colonoscopy. Ten tumour biopsies from colonoscopy were processed using cryo-sectioning. These samples then underwent DESI for 175 µm/s and all the data were processed using m/z 50–1500 and a bandwidth of 0.005 m/z for pathological assessment and comparison to nontumour samples. Colour maps were used to identify composites of the following: smooth muscle, submucosa, serosa, adenocarcinoma, inflammatory cells and benign mucosa. **Results:** DESI using m/z 50–1500 range has differentiated 6 pathological colorectal regions: adenocarcinoma, benign mucosa, smooth muscle, inflammatory cells, serosa and submucosa. Furthermore, these regions were found to differ between CRC adenocarcinoma and nontumour tissue. **Conclusion:** We have identified colonic metabolites for pathological regions using DESI. There is a metabolic difference among the different components of the tissue samples. These ionic differences can identify patterns for benign mucosa, inflammatory cell, smooth muscle, serosa, submucosa and adenocarcinoma tissue. However, further work needs to be completed to identify specific metabolic markers to predict response. This is a promising study that can potentially change the way neoadjuvant chemoradiation is determined/used in patients with rectal cancers.

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The association between hospital characteristics and minimally invasive rectal cancer surgery: a population-based study. ***Vanessa Wiseman, Kelly Brennan, Antonio Caycedo-Marulanda, Shaila Merchant, Chad McClintock, Sunil V. Patel.*** **From Queen's University.**

Background: We sought to identify hospital factors that are associated with utilization of minimally invasive surgery (MIS) for rectal cancer. **Methods:** This was a population-based study of individuals with rectal cancer who underwent low anterior resection or abdominal perineal resection between 2010 and 2019 in Ontario. Site of surgery, diagnosis and surgical procedure were identified using physician billing data, with MIS identified through surgical premium codes. The following factors were assessed for an association with utilization of MIS: geographic region, annual hospital volume, city size, cancer centre level, presence of fellowship and/or general surgery program, and presence/absence of a competing hospital within 20 km. Comparison of mean MIS rates was done using analysis of variance. **Results:** A total of 10 959 individuals with rectal cancer undergoing surgical resection were identified. Of these, complete surgical data were available in 7990, with 45% undergoing MIS. A total of 88 hospitals were identified. There was significant variation in MIS utilization among the 14 geographic regions (range 20%–81%, $p < 0.01$). There was no correlation between hospital volume and MIS rate ($p = 0.47$). Increasing city size was associated with the use of MIS (< 25K 34%, 25K–100K 33%, 100K–500K 50%, > 500K 57%, $p = 0.04$) as was the presence of a competing hospital within 20 km (58% v. 32%, $p < 0.01$). Neither the presence of a cancer centre ($p = 0.17$) or training program ($p = 0.71$) was associated with MIS. **Conclusion:** There is substantial regional variation in MIS utilization. Increasing hospital volume did not correlate with higher utilization rates, though larger city sizes did. Future inquiry is required to explore how these centres differ and how this relates to patient outcomes.

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Cancer centre level designation and the impact on treatment and outcomes in those with rectal cancer: a population-based study. ***Vanessa Wiseman, Chad McClintock, Clare Bankhead, Shaila Merchant, Antonio Caycedo-Marulanda, Chris Booth, Carl Heneghan.*** **From Queen's University.**

Background: We sought to assess whether cancer centre level designation is associated with care processes and outcomes in those with rectal cancer treated in a single-payer universal health care system. **Methods:** This was a retrospective study of 10941 individuals from the Ontario Rectal Cancer Cohort undergoing surgical resection for rectal cancer between 2010 and 2019. Quality of care processes and overall survival were assessed based on cancer centre level designation: regional cancer centre (level 1/2), affiliated cancer centre (level 3), satellite cancer centre and non-designated cancer centre (level 4+). **Results:** The cohort included 65% men with an mean age of 65 ± 13 years. Among the cohort, 54% of individuals had surgery at a level 1/2 centre, 33% at a level 3 centre and 13% at a level 4+ centre. Complete pretreatment investigations were associated with hospital designation (79% at level 1/2, 72% at level 3, 60% at level 4+, $p < 0.001$). In those with locally advanced disease, appropriate preoperative radiation (67% at level 1/2, 58% at level 3, 50% at level 4+, $p < 0.001$) and postoperative chemotherapy (62% at level 1/2, 52% at level 3, 56% at level 4+, $p < 0.001$) were associated with type of cancer centre. Five-year overall survival was also associated with hospital designation (80% at level 1/2, 79% at level 3, 75% at level 4+, $p = 0.003$). Adjusted Cox proportional hazards analysis found the following: level 4/5 hazard ratio (HR) 1.11, 95% confidence interval [CI] 0.99–1.25; level 3 HR 1.01, 95% CI 0.93–1.11. **Conclusion:** This study showed that cancer centre level designation was associated with appropriate pretreatment investigations, receipt of appropriate care and survival.

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Oncological outcomes after colorectal cancer in patients with liver cirrhosis: a systematic review and meta-analysis. ***Kelly Brennan*, *Lisa Zhang*, *Bright Huo*, *Alexandra Donaldson*, *Jennifer Flemming*, *Sulaiman Nanji*, *Antonio Caycedo-Marulanda*, *Shaila Merchant*, *Susan Brogly*, *Sunil Patel*. From Queen's University (Brennan, Zhang, Donaldson, Flemming, Nanji, Caycedo-Marulanda, Merchant, Brogly, Patel) and Dalhousie University (Huo).**

Background: Individuals with liver cirrhosis (LC) who develop colorectal cancer (CRC) may be at increased risk of treatment-related adverse events and inferior cancer outcomes than those without cirrhosis. The objective of this study was to determine outcomes in those with LC and CRC. **Methods:** This review was registered with PROSPERO and followed PRISMA guidelines. Random-effects models were used for meta-analyses. **Results:** Fourteen studies were included (21 488 patients with CRC and LC). Mean age range was 56–72 years. The percentage of female patients ranged from 14% to 54%. Seven of 14 papers included Child Turcotte Pugh (CTP) scores for severity of liver cirrhosis: 66% (345 of 521) CTPA, 30% (157 of 521) CTPB, and 4% (19 of 521) CTPC. Four papers included Model for End-Stage Liver Disease scores (median 8, range 6–21). Six papers included TMN stage of CRC: 2% stage 0 (10 of 453), 16% stage 1 (74 of 453), 35% stage 2 (160 of 453), 38% stage 3 (173 of 453), and 8% stage 4 (34 of 453). Most papers focused on early and perioperative outcomes: 30-day mortality (7%, 95% confidence interval [CI] 4%–11%, 8 of 14 papers, n = 15 573), median length of stay (13 d, range 9–20, 10 of 14 papers, n = 9189) and postoperative complications (43%, 95% CI 32%–54%, 9 of 14 papers, n = 6118). Rate of liver-related complications was 18% (95% CI 14%–23%, 5 of 14 papers, n = 4370). Rate of adjuvant chemotherapy was 49% (95% CI 38%–61%, 6 of 14 papers, n = 834). Five-year overall survival was 56% (95% CI 44%–67%, 5 of 14 papers, n = 804). No other oncologic-related outcomes were reported in more than 1 paper. One paper compared 5-year overall survival by stage between patients with CRC and LC v. CRC alone (69% v. 91%, stage 1–0; 67% v. 88%, stage 2; 37% v. 76%, stage 3; and 0% v. 34%, stage 4). **Conclusion:** Individuals with LC and CRC have inferior cancer outcomes than those without LC, though the current literature is heterogeneous and limited. More research into this patient population is required.

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Optimal preoperative nutrition for penetrating Crohn disease: a systematic review and meta-analysis. ***Laura Baker*, *Tori Lenet*, *Lily Park*, *Sanjay Murthy*, *Reilly Musselman*. From University of Ottawa (Baker, Lenet, Murthy, Musselman) and McMaster University (Park).**

Background: Guidelines recommend preoperative nutrition optimization in patients with penetrating Crohn disease. However, recommendations on formulation, route of administration, and duration are lacking. The purpose of this review was to determine if a superior preoperative nutritional optimization strategy exists for patient undergoing surgery for penetrating Crohn disease. **Methods:** Electronic databases were searched from January 2000 to February 2021 for studies reporting preoperative nutritional optimization strategies in patients undergoing surgery for septic complications from penetrating Crohn disease. Information pertaining to study design, patient population, preoperative nutritional optimization strategy, and postoperative adverse events were extracted. Qualitative synthesis and meta-analysis using a random-effects model were performed as appropriate. **Results:** Seven retrospective, 5 prospective cohort, and 1 randomized controlled trial involving 1518 patients were included. Seven studies compared exclusive enteral nutrition (EEN) to standard of care; the remainder compared various other nutritional regimens, including oral nutritional supplementation and parenteral nutrition. In the meta-analysis of studies comparing EEN to standard of care, EEN was associated with reduction in anastomotic leak (odds ratio [OR] 0.41, 95% confidence interval [CI] 0.20–0.84, n = 5 studies, 587 patients), wound infection (OR 0.47, 95% CI 0.3–0.75, n = 6 studies, 657 patients), and a trend toward reduction in postoperative adverse events (OR 0.56, 95% CI 0.31–1.01). There was no difference in risk of diverting loop ileostomy at the time of surgery or length of hospital stay. This review had several limitations. First, the majority of included studies were retrospective and observational in nature; this likely introduced significant selection bias into the results, thereby limiting the certainty of conclusions that can be drawn from this meta-analysis. Furthermore, the limited number of studies reporting adjusted data precluded sensitivity analysis of adjusted data. There was also appreciable heterogeneity in baseline characteristics of included patient populations as well as in the formulation and duration of the prescribed nutritional regimens. Finally, the lack of studies evaluating nutritional optimization strategies other than EEN, such as parenteral nutrition, limits our ability to determine and compare the efficacy of these techniques. **Conclusion:** Nutritional optimization with EEN may be associated with improved postoperative outcomes in patients undergoing bowel resection for penetrating Crohn disease, specifically anastomotic leak and wound infection. The development of a standardized evidence-based preoperative nutritional optimization strategy is warranted for this complex patient population.

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Lymph node ratio as a predictor of survival for colon cancer: a systematic review and meta-analysis. ***Simarpreet Ichhpuniani*, *Tyler McKechnie*, *Jay Lee*, *Jeremy Biro*, *Yung Lee*, *Lily Park*, *Aristithes Doumouras*, *Dennis Hong*, *Cagla Eskicioglu*. From McMaster University.**

Background: Lymph node ratio (LNR) is the number of lymph nodes with evidence of metastases on pathological review compared with the total number of lymph nodes harvested during oncologic resection. LNR is a proven predictor of long-term survival following oncologic resection for colon cancer. Yet these data have not been meta-analyzed to determine the long-term prognosis associated with different LNR cut-offs. **Methods:** MEDLINE, Embase, and CENTRAL were systematically searched. Articles were included if they compared 5-year overall survival (OS) or disease-free survival (DFS) between different LNRs for patients undergoing oncologic resection for stage I–III

colon cancer. Studies examining LNRs in rectal cancer patients or with metastatic disease were excluded. Pairwise meta-analyses using inverse variance random effects were performed. Risk of bias was evaluated according to the Methodological Index for Non-Randomized Studies (MINORS). **Results:** From 2587 citations, 8 studies conducted between 2009 and 2018 with 97 631 patients (52.0% female, mean age 62.9 yr) were included. The median stage of colon cancer among the included patients was stage III. An LNR above 0.1 resulted in a 49% decrease in the odds of 5-year OS (2 studies, odds ratio [OR] 0.51, 95% confidence interval [CI] 0.49–0.53, $p < 0.00001$). An LNR above 0.25 resulted in a 56% decrease in the odds of 5-year OS (3 studies, OR 0.44, 95% CI 0.43–0.45, $p < 0.00001$). An LNR above 0.5 resulted in a 65% decrease in the odds of 5-year OS (2 studies, OR 0.35, 95% CI 0.33–0.37, $p < 0.00001$). Mean MINORS score was 16.75 ± 2.19. **Conclusion:** LNRs from 0.1 to 0.5 are effective predictors of 5-year OS for colon cancer. Greater LNRs do not confer worsened survival. Further study is required to determine whether LNR can inform which patients may benefit from more aggressive adjuvant therapy and follow-up protocols.

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Barriers and facilitators for use of new recommendations for optimal endoscopic localization of colorectal neoplasms according to gastroenterologists and surgeons. ***Garrett Johnson, Harminder Singh, Ramzi Helewa, Kristin Reynolds, Kathryn Sibley, Malcolm Doupe*****. From the University of Manitoba.**

Background: Repeat endoscopy before surgery for colorectal neoplasms is very common (29%–40% of tumours). Nonstandard documentation and inadequate tumour marking are the primary causes. Recommendations for localizing and documenting colorectal lesions were recently developed by our group through a systematic review and Canadian Delphi consensus process. This study aimed to identify barriers and facilitators to following the new recommendations in our city. **Methods:** Gastroenterologists and surgeons were purposely sampled from all local hospitals and endoscopy suites. Participants were introduced to the recommendations and asked for their perspectives in semistructured interviews. Directed content analysis was used to map participant perspectives to constructs that have been previously associated with effective implementation called the Consolidated Framework for Implementation Research. **Results:** Ten surgeons and 11 gastroenterologists participated (57% academic practice, 24% female). Among participants, 80% of the surgeons perform colonoscopy regularly. The new recommendations were viewed as adaptable, compatible with local skills, and preferable to alternate solutions to repeat preoperative endoscopy. The simplicity of the recommendations and the way they were presented were strengths. The central intake organization for endoscopy, strong interdisciplinary communication networks, and the learning environment were all facilitators. Several barriers were identified. Familiarity with the evidence behind some recommendations was lacking. No formal relevant feedback structure exists. Fee-for-service reimbursement incentivizes noncompliance with the recommendations. There were no internal organizational incentives. Key resources requested by participants to facilitate uptake of the recommendations were unavailable. Finally, some surgeons reported they were likely to continue to repeat preoperative endoscopy regardless of the new recommendations unless they performed the index endoscopy themselves. **Conclusion:** We identified barriers and facilitators to using new recommendations for colorectal lesion localization locally. Next steps are to identify targeted strategies to overcome these barriers to facilitate use of the new recommended practices.

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Emergency colorectal surgery in patients with cirrhosis: a population-based descriptive study. ***Lisa Zhang, Kelly Brennan, Jennifer Flemming, Sulaiman Nanji, Shaila Merchant, Maya Djerboua, Antonio Caycedo-Marulanda, Sunil Patel*****. From University of Ottawa (Zhang) and Queen's University (Brennan, Flemming, Nanji, Merchant, Djerboua, Caycedo-Marulanda, Patel).**

Background: Individuals with cirrhosis have increased postoperative risks following major abdominal surgery, especially in those undergoing emergency operations. Many risk-prediction models and previously reported results may not reflect current outcomes, owing to better medical management of cirrhosis and improved perioperative practices. The objective of this study was to assess short-term outcomes in individuals with cirrhosis undergoing emergency colorectal surgery. **Methods:** This retrospective cohort included individuals in Ontario with a diagnosis of cirrhosis. Individuals who underwent emergent colorectal surgery between 2009 and 2017 were included. Baseline characteristics, cirrhosis and surgery-specific characteristics, and outcomes were identified using linked provincial administrative databases. The primary outcomes were in-hospital mortality and 90-day mortality. Secondary outcomes included length of stay, intensive care unit admission, hepatic decompensation, emergency department visits, and readmission. Univariate and multivariate analyses were completed for 90-day mortality. **Results:** We included 927 unique individuals (56% male) with cirrhosis who underwent emergency colorectal surgery. The median Model for End-Stage Liver Disease-Na (MELD-Na) score was 12; 8% of participants had a history of hepatic decompensation. Nonalcoholic fatty liver disease was the most common cause of cirrhosis (50%), followed by alcohol-related (32%). Colorectal cancer was the most common reason for surgery (35%). In-hospital mortality and 90-day mortality were 25% and 32%, respectively. Seventeen percent of patients experienced hepatic decompensation within 90 days. MELD score was associated with 90-day mortality (MELD < 10, 17%; MELD 10–19, 32%; MELD > 20, 65%). On multivariable analysis, age (relative risk [RR] 1.03, 95% confidence interval [CI] 1.02–1.04, $p < 0.001$) and cirrhosis etiology (alcohol-related: RR 1.31, 95% CI 1.07–1.60, $p < 0.01$; other: RR 1.37, 95% CI 1.06–1.75, $p < 0.001$) were associated with 90-day mortality. **Conclusion:** In this large contemporary population-based study of individuals with cirrhosis undergoing emergent colorectal surgery, the short-term mortality outcomes were similar to those reported in previous literature. The MELD score was a valid predictor of short-term mortality in this group of patients.

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Local recurrence rates and associated risk factors after transanal endoscopic microsurgery for benign polyps and adenocarcinomas. ***James Holden, Garrett Johnson, David Hochman, Ramzi Helewa.*** **From the University of Manitoba.**

Background: Transanal endoscopic microsurgery (TEM) is frequently used for the management of benign and malignant rectal lesions. Estimates of local recurrence rates vary considerably. This research aimed to define the rate of local recurrence after TEM for benign polyps and invasive adenocarcinoma, and to describe associated risk factors. **Methods:** This was a retrospective study conducted at 2 academic hospitals. All adult patients who underwent TEM between 2008 and 2020 for either a benign polyp or invasive adenocarcinoma were included. The primary outcome was the rate of local recurrence detected by endoscopy in each patient group. Univariate and multivariate analyses were performed to identify associated risk factors. **Results:** Among 357 eligible patients who underwent TEM for benign polyps, the local recurrence rate was 6.2% over a median follow-up period of 11 months. Positive margin was correlated with local recurrence on univariate (hazard ratio [HR] 8.024, 95% confidence interval [CI] 3.274–19.666) and multivariate (HR 8.012, 95% CI 2.781–23.084) analysis. TEM defect closure was associated with a lower rate of local recurrence on univariate (HR 0.181, 95% CI 0.070–0.471) and multivariate (HR 0.191, 95% CI 0.062–0.588) analysis. Among 124 patients with adenocarcinoma, the local recurrence rate was 9.7% over a median follow-up period of 14.19 months. T3 pathologic tumour stage was associated with local recurrence on multivariate analysis (HR 7.860, 95% CI 0.999–61.841). Mucinous tumour features were associated with local recurrence on both univariate (HR 22.233, 95% CI 4.269–115.774) and multivariate (HR 37.955, 95% CI 2.868–502.378) analysis. This study is limited by its retrospective nature and the duration of follow-up. **Conclusion:** Local recurrence after TEM for benign polyps was 6.2%, with positive margin as a risk factor and surgical defect closure as a protective factor. Local recurrence for adenocarcinoma was 9.7%, with mucinous histology and T3 pathologic stage as risk factors.

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Bowel dysfunction impacts mental health after restorative proctectomy for rectal cancer. ***Jeongyoon (Jenny) Moon, Richard Garfinkle, Sophie Dell'Aniello, Phyllis Zelkowitz, Carol-Ann Vasilevsky, Paul Brassard, Marylise Boutros.*** **From McGill University.**

Background: Most rectal cancer patients experience bowel symptoms after restorative proctectomy (RP). The prevalence of mental health disorders post-RP and its association with bowel symptoms are unknown. The objectives of our study were to describe the prevalence of mental health disorders in patients who underwent RP for rectal cancer and to study the association between postoperative functional impairment and mental health disorders. **Methods:** This was a retrospective cohort study using 2 linked databases: Clinical Practice Research Datalink (CPRD) and Hospital Episode Statistics (HES). Adult patients who underwent RP for rectal neoplasm between 1998 and 2018 were included. The main exposures were postoperative bowel, sexual, and urinary symptoms. The primary outcome was postoperative mental health disorders, defined using diagnosis and medication codes for depression, anxiety, psychosis, sleep, and substance use disorder. The associations between postoperative bowel, sexual, and urinary dysfunction and mental health disorders were studied using Cox proportional hazard regression models. **Results:** In total, 2197 patients who underwent RP and were ostomy-free were identified. During 8138 person-years follow-up, there were 910 patients with postoperative mental health disorders (rate 11.2 per 100 person-year). On Cox proportional hazards regression model, older age (70–79 yr, adjusted hazard ratio [aHR] 1.20, 95% confidence interval [CI] 1.02–1.42), female gender (aHR 1.35, 95% CI 1.18–1.54), postoperative bowel (aHR 1.26, 95% CI 1.06–1.51), and urinary dysfunction (aHR 1.54, 95% CI 1.21–1.96) were significantly associated with mental health disorders post-RP. Among a select cohort of patients (n = 1056) with no preoperative functional impairment or psychiatric history, 466 (32.0%) patients developed de novo mental health disorders. Bowel (aHR 1.41, 95% CI 1.12–1.76) and urinary dysfunction (aHR 1.57, 95% CI 1.16–2.14) post-RP were associated with developing incident mental health disorders. **Conclusion:** A significant proportion of patients experience postoperative mental health disorders following RP for rectal cancer. The presence of bowel and urinary dysfunction increases the risk of poor psychological outcomes among rectal cancer survivors.

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Evolution of psychological morbidity following restorative proctectomy for rectal cancer: a systematic review and meta-analysis. ***Jeongyoon (Jenny) Moon, Amine Zoughlami, Wusiman Abibula, Alex Amar, Gabriela Ghitulescu, Carol-Ann Vasilevsky, Paul Brassard, Marylise Boutros.*** **From McGill University.**

Background: Rectal cancer patients treated with restorative proctectomy (RP) are at risk of experiencing bowel dysfunction, which is associated with emotional distress and social isolation. The objective of this study was to conduct a systematic review and meta-analysis on mental health outcomes following RP for rectal cancer during the postoperative recovery phase. **Methods:** MEDLINE, Embase, and the Cochrane library were systematically searched until May 2021 to identify studies reporting on the evolution of mental health outcomes over time, as measured by validated assessment tools selected a priori. Two independent reviewers extracted data and assessed risk of bias. Average scores for mental health outcome were pooled across studies at each time point using a random-effects model. Fourteen prospective cohort studies and 7 randomized controlled trials were included in the systematic review. Sixteen studies provided average and variance of mental health outcome using the Emotional Function subscale of the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (EORTC-QLQ-C30-EF) or the

Mental Health Component Summary Scores of the Short Form-36 (SF-36-MCS) and were included in the meta-analysis. **Results:** A significant improvement in mental health outcome was detected over time from baseline to 3 years after RP (R^2 = 0.76, p = 0.02) as measured by pooled scores of the EORTC-QLQ-C30-EF. No significant trend in SF-36-MCS (R^2 = 0.55, p = 0.15) was observed from baseline to 2 years. Nine studies examined changes in mental health outcome scores over time using a statistical analysis, of which 6 studies showed improvement in EORTC-QLQ-C30-EF score, with statistically significant improvements observed as of 6 months. **Conclusion:** Rectal cancer patients experience significant changes in mental health outcomes post-RP. Improvement in mental health is observed as of 6 months posttreatment. Future studies evaluating the effectiveness of perioperative support interventions in this period will further provide solutions to improve mental health outcomes.

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Frailty predicts LARS and quality of life in rectal cancer survivors after restorative proctectomy. ***Jeongyoon (Jenny) Moon, Théa Araji, Allison Pang, Carol-Ann Vasilevsky, Marylise Boutros.*** **From McGill University.**

Background: Many rectal cancer patients are frail and the majority experience low anterior resection syndrome (LARS) after restorative proctectomy (RP). Association between frailty and LARS is unknown. We hypothesized that frailty, rather than older age, is associated with LARS. **Methods:** This was a retrospective cohort study with cross-sectional follow-up at a single tertiary care hospital. Patients over age 65 years who underwent RP for rectal cancer between 2007 and 2020 were included. Frailty was measured using the Targeted Geriatric Assessment, a multidimensional questionnaire that assesses function, mobility, social support, cognitive performance, depression, polypharmacy, and nutritional status. Global quality of life (QoL) was measured by the European Organization for Research and Treatment of Cancer-QoL Questionnaire-C30 (EORTC-QLQ-C30). The association between LARS, frailty, and QoL was then assessed using multiple linear regression. **Results:** Of 126 eligible rectal cancer survivors who were contacted, 52 completed the questionnaires (response rate 41.3%) at a median follow-up of 8.3 (interquartile range 5.1–10.9) years after RP. Ten (19.2%) individuals were classified as frail. Frail individuals were more likely to have major LARS (40.0% v. 23.8%, p = 0.52) when compared with nonfrail individuals. Individuals with major LARS had a higher mean frailty score (0.27 ± 0.11 v. 0.17 ± 0.12, p = 0.019) compared with those with minor/no LARS. On multiple linear regression, younger age (β = –0.80, p = 0.002), female gender (β = 6.56, p = 0.002), and a higher frailty score (β = 3.84, p = 0.005) were independently associated with worse LARS. Furthermore, after adjusting for age, gender, LARS, and time from surgery, frailty score alone also predicted a lower global QoL (β = –5.50, p = 0.003). **Conclusion:** Frailty, rather than older age, is an independent predictor of LARS and QoL among rectal cancer survivors after RP. Assessment of frailty and interventions to improve frailty status perioperatively have the potential to improve long-term functional and QoL outcomes among rectal cancer patients.

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Low anterior resection syndrome in a reference North American population: prevalence and predictive factors. ***Jeongyoon (Jenny) Moon, Alexa Ehlebracht, Julio Faria, Gabriela Ghitulescu, Nancy Morin, Allison Pang, Carol-Ann Vasilevsky, Marylise Boutros.*** **From McGill University.**

Background: Studying low anterior resection syndrome (LARS) in the general population can help better interpret to what extent the severity of bowel dysfunction in rectal cancer patients is related to the disease and/or treatment. Currently, North American LARS normative data do not exist. The aim of this study was to describe the prevalence of bowel dysfunction as measured by LARS score and quality of life (QoL) in a reference North American population, and to identify any associations between participant characteristics and LARS. **Methods:** This was a single-institution cross-sectional study of adults who underwent screening colonoscopies between 2018 and 2021 with no or benign endoscopic findings. Exclusion criteria were personal history of colorectal cancer, radiotherapy or inflammatory bowel disease. Outcomes were LARS and QoL. Multivariable linear regression accounting for a priori clinical factors associated with bowel and pelvic floor dysfunction was performed. **Results:** Of 1004 eligible adults, 502 (50.0%) participated, and 135 (26.9%) had major/minor LARS. A greater proportion of females lived with major/minor LARS compared with males. Participants with LARS were more likely to have depression (18.5% v. 9.0%, p < 0.05). On multiple linear regression, female gender (β = 2.15, 95% confidence interval [CI] 0.30 to 4.00); younger age (β = –0.10, 95% CI –0.18 to –0.03); white ethnicity (β = 2.45, 95% CI 0.15 to 4.74); and presence of at least 1 of diabetes, depression, neurologic disorder, or cholecystectomy (β = 3.54, 95% CI 1.57 to 5.51) were independently associated with higher LARS score. Individuals with LARS had lower global QoL, functional subscales and various symptom subscales scores. **Conclusion:** Our study identified important risk factors for LARS, which should be taken into account when counselling patients regarding rectal cancer treatment strategies and long-term outcomes. These normative data will allow for more accurate interpretation of ongoing studies on LARS in North American rectal cancer patients.

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The evolution of enhanced recovery: same day discharge after laparoscopic colectomy. ***Tiffany Paradis, Stephan Robitaille, Mahalia Oliver, Patrick Charlebois, Barry Stein, Sender Liberman, Liane S. Feldman, Lawrence Lee.*** **From McGill University Health Centre (Paradis, Robitaille, Oliver, Charlebois, Stein, Liberman, Feldman, Lee) and Steinberg-Bernstein Centre for Minimally Invasive Surgery and Innovation (Oliver).**

Background: Same-day discharge (SDD) after laparoscopic colectomy may further improve efficiency of enhanced recovery pathways, but there are few data from a Canadian population and setting. We sought to report the outcomes of a SDD

program in patients undergoing elective laparoscopic colorectal resection. **Methods:** Adult patients undergoing elective laparoscopic colectomy or ostomy reversal between February 2020 and January 2022 were screened for eligibility. Patients were eligible if they lived within a 30-minute drive from the hospital, had an adequate support system at home, and owned a smartphone. Patients were discharged on postoperative day (POD) 0 if they tolerated clear liquids, had adequate oral analgesia, and were able to ambulate and urinate independently. All patients had postdischarge remote follow-up using a mobile application for 30 days following surgery. The main outcome of this study was the success rate of SDD, defined as discharge on POD 0 without an unplanned visit (emergency department [ED] ± readmission) within 72h. Outcomes of SDD were compared with a control group of contemporaneous patients meeting inclusion criteria who were not enrolled in SDD, managed with a mature enhanced recovery pathway (target length of stay [LOS] 3 d). Secondary outcomes included LOS, 30-day complications, and unplanned visits. **Results:** A total of 114 patients were enrolled for SDD, with 122 in the control group. Overall, 84% of SDD patients were discharged on POD 0, of whom only 5% required early unplanned visits, resulting in a success rate of 79%. There were no differences in 30-day complications, ED visits and readmissions rates when compared with the control group. Mean LOS was significantly shorter in the overall SDD cohort compared with controls. Patients in whom SDD failed had similar LOS as the control group. **Conclusion:** SDD is feasible in select patients undergoing elective laparoscopic colorectal surgery with remote follow-up without increasing unplanned visits after discharge. This may allow for more efficient health care resource utilization.

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Effect of ERAS protocols on length of stay after colorectal surgery: an interrupted time series analysis. ***Zubair Bayat, Erin Kennedy, Charles Victor, Anand Govindarajan.*** **From the University of Toronto.**

Background: Enhanced Recovery after Surgery (ERAS) has been shown to reduce length of stay (LOS) after colorectal surgery (CRS), although this effect has not been demonstrated in a study accounting for pre-existing trends toward decreasing LOS over time. In the 2012 iERAS study, ERAS was implemented at select hospitals. This study's objective was to assess the impact of ERAS protocol implementation on LOS after CRS, independent of pre-existing trends toward decreasing LOS. **Methods:** Using administrative data, the mean LOS for 1-month periods was ascertained between 2009 and 2018. An interrupted time series (ITS) analysis was performed using September 2012 as the interruption point. Level change and slope change values were calculated for mean LOS. Autocorrelation was assessed and accounted for. As a sensitivity analysis, the ITS was repeated for patients undergoing surgery without complications, for patients undergoing right-sided CRS and for patients undergoing other CRS. **Results:** We analyzed 32 612 patients. ERAS protocols were associated with a 1.05-day reduction in LOS (level change –1.05, 95% confidence interval [CI] –1.37 to –0.73, $p < 0.0001$). The existing trend toward decreasing LOS did not accelerate because ot ERAS (slope change –0.006, 95% CI –0.02 to 0.004, $p = 0.24$). All analyses demonstrated ERAS-related reductions in LOS (level change). The magnitude of this effect was greatest in patients undergoing surgeries other than right-sided CRS (level change –1.17, 95% CI –1.57 to –0.77, $p < 0.0001$). In all analyses, the velocity of the decrease in LOS over time did not change significantly because of the implementation of ERAS protocols. Independent of pre-existing trends, ERAS protocol implementation reduced LOS after CRS. This effect was observed after ERAS implementation, although individual protocol elements may have already been implemented. **Conclusion:** Our findings bolster existing evidence for the efficacy of ERAS protocols at reducing LOS after CRS and highlights the importance of protocolized care for patients undergoing CRS.

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Practice patterns and outcomes in individuals with cirrhosis and colorectal cancer: a population-based study. ***Sunil Patel, Lisa Zhang, Kelly Brennan, Maya Djerboua, Sulaiman Nanji, Shaila J. Merchant, Antonio Caycedo-Marulanda, Jennifer Flemming.*** **From Queen's University (Patel, Brennan, Nanji, Merchant, Caycedo-Marulanda, Flemming), University of Ottawa (Zhang), and ICES Queen's University (Djerboua).**

Background: Individuals with cirrhosis who develop colorectal cancer (CRC) are an understudied group, and there is a suspicion that this group has high treatment-related complications and poor survival. The objective of this study was to assess practice patterns and outcomes of those with cirrhosis and colorectal cancer treated within a universal health care system. **Methods:** This is a retrospective population-based cohort study of individuals with cirrhosis who underwent surgery for CRC between 2009 and 2017 in Ontario, Canada (population 14.6 million), using linked administrative databases. Patients with cirrhosis and CRC were identified using previously validated algorithms. Descriptive statistics were used to describe baseline characteristics, type of surgical procedure, usage of pre- and postoperative chemotherapy/radiation therapy, postsurgical hepatic decompensation, short-term complications and overall survival. **Results:** A total of 842 individuals were identified (83% colon cancer, 17% rectal cancer). The most common cirrhosis etiologies were nonalcoholic fatty liver disease (52%) and alcohol-associated (29%). The median Model for End-stage Liver Disease (MELD-Na) score was 9 (interquartile range 7–11). Overall 90-day mortality was 12% (6.8% in those with MELD < 10 and 22% in those with MELD ≥ 10). Ninety-day readmission (27%) and emergency department visits (40%) were common, while 90-day hepatic decompensation was less so (9%). In those with locally advanced rectal cancer (stage II/III), 62% ($n = 55$ of 89) received neoadjuvant radiation and 38% ($n = 34$ of 89) received adjuvant chemotherapy. In those with stage III colon cancer, 43% received adjuvant chemotherapy ($n = 90$ of 213). Five-year overall survival was 52% for colon cancer and 56% for rectal cancer. Stage-specific 5-year survival was as follows: stage I 66%, stage II 55%, stage III 50%, stage IV 11%. **Conclusion:** This population-based study reported practice patterns and short/long-term outcomes of those with cirrhosis and CRC. Complications were common, and survival was poor.

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Understanding the impact of bowel function on quality of life after rectal cancer surgery. ***Michael Fares Maalouf, Stephan Robitaille, Ruxandra Penta, Makena Pook, Julio Flavio Fiore Jr., Liane Feldman, Lawrence Lee.* From McGill University.**

Background: Bowel dysfunction is an important consequence of rectal cancer surgery; however, the specific quality of life (QoL) domains that are affected remain unaddressed by generic surveys. This study aims to identify QoL domains most affected by rectal cancer surgery. **Methods:** Adult patients who underwent sphincter-preserving rectal cancer surgery at a single university-affiliated colorectal referral centre between July 2017 and July 2020 were included. Patients were excluded if their surgery was less than 1 year since recruitment or they developed local recurrence or metastasis. Semistructured interviews were conducted by phone. Patients were asked to identify QoL domains most affected by symptoms. Bowel dysfunction was evaluated via the low anterior resection syndrome (LARS) score. Interviews were coded by 2 independent reviewers. Mixed-methods analysis was used to identify themes and their frequency of occurrence. **Results:** A total of 54 patient interviews were analyzed. Mean time to interview was 49.5 ± 32.6 months, mean age was 63.7 ± 8.6 years, and 75.9% were male. The proportion of patients with no, minor, and major LARS was 38.9%, 22.2%, and 38.9%, respectively. Interview analysis revealed 5 QoL-related themes impacted by bowel function: 1) experiencing psychological and emotional stress, 2) challenging roles and relationships within society, 3) encountering physical limitations, 4) restricting leisure and recreational activities, and 5) self-empowerment and adapting to change. Patients with minor or major LARS had significantly more disruption to social activities and role as a sexual partner than those with no LARS. Patients with major LARS were significantly more likely to report sleep disturbances than those with no and minor LARS. **Conclusion:** The impact of bowel dysfunction on QoL after rectal cancer surgery extends beyond traditional QoL measures and varies significantly with LARS score. These results may help support patients in the preoperative setting and contribute to the development of a patient-centred rectal cancer QoL survey.

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Right-sided colectomies for diverticulitis have worse outcomes compared with left-sided colectomies. ***Alon Wachtel, Nathalie Wong-Chong, Daniel Marinescu, Sahir Bhatnagar, Nancy Morin, Gabriela Ghitulescu, Carol-Ann Vasilevsky, Julio Faria, Marylise Boutros.* From McGill University (Wachtel, Marinescu, Bhatnagar, Morin, Ghitulescu, Vasilevsky, Faria, Boutros) and University of Toronto (Wong-Chong).**

Background: Right- and left-sided diverticulitis share some similar clinical features. However, there are limited data on the surgical outcomes following resection for right-sided diverticular disease. This is an updated analysis of 30-day postoperative outcomes following colectomy for right- and left-sided diverticulitis. **Methods:** We performed a cohort study using the American College of Surgeons National Surgical Quality Improvement Program database comparing all cases of right- and left-sided colectomy for diverticulitis between 2005 and 2019. Patient characteristics and postoperative outcomes were collected. The main outcomes were anastomotic leak, major morbidity, mortality, reoperation, length of stay and readmission. Predictors of the predefined outcomes were analyzed by multiple logistic and linear regression. **Results:** In total, 954 (1.3%) patients underwent a right-sided colectomy and 71135 (98.7%) underwent a left-sided colectomy. Right-sided colectomy was associated with younger age (mean 56.1 ± 14.5 yr v. 58.3 ± 12.8 yr, $p < 0.001$), Asian origin (5.2% v. 0.8%, $p < 0.001$), emergency surgery (20.0% v. 11.4%, $p < 0.001$), and fewer stomas (0.5% v. 16.5%, $p < 0.001$). On multivariate regression model, right-sided colectomies were associated with increased risk of anastomotic leak (odds ratio [OR] 1.69, 95% confidence interval [CI] 1.08–2.64), major morbidity (OR 1.38, 95% CI 1.01–1.87) and increased length of stay ($\beta = 1.27$, 95% CI 1.18–1.37); however, laterality of disease was not predictive for readmission (OR 1.29, 95% CI 0.93–1.79), mortality (OR 0.98, 95% CI 0.34–2.86) or reoperation (OR 1.35, 95% CI 0.89–2.05). Emergency surgery was a predictor of mortality (OR 1.82, 95% CI 1.22–2.72), but not of major morbidity (OR 1.08, 95% CI 0.93–1.25). **Conclusion:** Right-sided colectomies were more likely to be performed emergently than left-sided colectomies for diverticulitis and were associated with significantly higher risk of anastomotic leak, risk of major morbidity and length of stay.

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Symptom burden and time from symptom onset to cancer diagnosis in patients with early-onset colorectal cancer. ***Victoria Baronas, Arif Arif, Gale Ladua, Eric Bhang, Carl Brown, Fergal Donellan, Heather Stuart, Jonathan Loree.* From the University of British Columbia.**

Background: The incidence of colorectal cancer (CRC) is decreasing in individuals aged > 50 years owing to organized screening. For younger individuals, however, the incidence has increased. **Methods:** We aimed to identify the pattern of presentation in young individuals and determine whether young patients may have delayed diagnosis despite symptoms that prompt investigation. **Results:** The average number of presenting symptoms in early-onset CRC (EoCRC) was 2.6 ± 1.4 v. 1.8 ± 1.5 in late-onset CRC (LoCRC) ($p < 0.0001$). In EoCRC, the time from symptom onset to cancer diagnosis was significantly longer at 169 ± 157 v. 128 ± 176 days in LoCRC ($p < 0.0001$). The number of symptoms at diagnosis was associated with worse overall survival (OS) in both EoCRC ($p < 0.0001$) and LoCRC ($p < 0.0001$) groups. EoCRC presenting with ≤ 3 symptoms had improved OS v. LoCRC (5-yr OS 66% v. 37%, $p < 0.0001$). If presenting with ≥ 4 symptoms, there was no difference in OS (5-yr OS 33% v. 30%, $p = 0.49$). Median survival for all EoCRC (96 mo) was significantly better than for LoCRC (47 mo) (hazard ratio [HR] 1.5, 95% confidence interval [CI] 1.4–1.7). The symptoms at presentation that predicted worse OS in EoCRC included ascites (HR 5.3, 95% CI 2.0–14) and night sweats (HR 3.5, 95% CI 1.9–6.6). In LoCRC, the symptoms that predicted worse survival were sacrococcygeal pain (HR 2.8, 95% CI 1.3–5.8) and anorexia (HR 2.2, 95% CI 1.6–3.0). Out of the EoCRC, 28% presented with metastatic disease compared with 23% in

LoCRC (odds ratio 1.3, 95% CI 1.2–1.5). **Conclusion:** EoCRC who present with fewer symptoms have improved OS. However, their time to diagnosis is delayed and they present with more symptoms and at a later stage on average than LoCRC. Improvement in early detection of CRC in patients aged < 50 years would lead to a significant improvement in OS.

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The impact of access to robotic rectal surgery at a tertiary care centre: a Canadian perspective. ***Vanessa Wiseman*, *Sunil Patel*, *Lisa Zhang*, *Peter Hugh MacDonald*, *Shaila Merchant*, *Kathleen Wattie Barnett*, *Antonio Caycedo-Marulanda*. From Queen's University.**

Background: Robotic surgery for colorectal pathology may overcome technical challenges and limitations of traditional laparoscopic surgery. Concerns regarding costs may limit its use in Canada. The objective of this paper was to assess how access to robotic surgery has impacted outcomes in patients with rectal cancer at a tertiary care hospital in Ontario. **Methods:** We compared outcomes between the "robotic phase" (April 2019–December 2020) and "prerobotic phase" (June 2019–March 2019) at a high-volume rectal cancer centre in Ontario. An equal number of consecutive patients were compared. The primary exposure was access to robotic surgery. Outcomes included utilization and successful completion of minimally invasive surgery, length of stay, operative time, in-patient cost of care (including operative and nonoperative costs) and quality of surgical resection based on pathology reports. **Results:** A total of 172 individuals with rectal cancer were included in this study, with 86 individuals in each group. Age, sex, American Society of Anesthesiologists score, body mass index, cancer stage and use of neoadjuvant therapy were similar between groups. Type of surgery (low anterior resection v. abdominoperineal resection) was similar between groups. A higher proportion of individuals underwent an attempt at minimally invasive surgery (either laparoscopic or robotic) in the robotics phase (93% v. 66%), with a lower rate of conversion (7.5% v. 30%). Mean surgical time was similar between groups (4.3 h v. 4.3 h, $p = 0.86$). Average length of stay (5.1 d v. 9.2 d, $p = 0.0002$) and median length of stay (4 d, interquartile range [IQR] 3–5.25 v. 6 d, IQR 4–10.5) favoured the robotic phase. Average total cost of care was less during the robotics phase (–$1103). Quality of surgical resection was similar between the robotic phase and pre-robotic phase, including complete/near complete mesorectal excision (99% v. 100%) and circumferential margin positivity (1.5% in both groups). **Conclusion:** Implementation of a robotic rectal cancer surgery program at a tertiary care centre in Ontario resulted in improved clinical outcomes, without a significant increase in the cost of care. Although this reports the experience of a single institution, we have shown that robotic colorectal surgery is feasible and cost effective.

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Management of rectal neuroendocrine tumours by transanal endoscopic microsurgery. ***Jessica Lie*, *Carl Brown*, *Ahmer Karimuddin*, *Heather Stuart*, *Amandeep Ghuman*, *Terry Phang*, *Manoj Raval*, *Hyea Min Yoon*. From University of British Columbia (Lie, Brown, Karimuddin, Stuart, Ghuman, Phang, Raval) and University of Calgary (Yoon).**

Background: Transanal endoscopic microsurgery (TEM) is a minimally invasive technique to perform full-thickness local excision for rectal lesions. It is used to treat select rectal neuroendocrine tumours (NETs) and imparts minimal morbidity when compared with radical surgery. The objective of this study was to evaluate the safety and effectiveness of TEM for rectal NETs. **Methods:** A retrospective cohort study of all pathology-confirmed rectal NETs treated by TEM between April 2007 and December 2020 at a tertiary centre was performed. Demographic, clinical, radiographic, and pathologic data were collected. Descriptive statistics were determined. **Results:** There were 58 patients treated by full-thickness TEM excision. TEM referrals were for primary excision (15, 25.9%), completion re-excision after incomplete endoscopic removal (37, 63.8%) or locally recurrent NET (6, 10.3%). Mean age of patients was 56.4 ± 11.9 years and 26 (44.8%) patients were female. Mean macroscopic tumour size was 7.4 ± 3.8 mm (range 1–15). Most (72.9%) were grade 1 tumours. Mean operative time was 37.2 ± 17.2 minutes, and 56 (96.4%) patients were discharged on the same day. The 2 patients who were admitted overnight for monitoring did not require further intervention. There were no intraoperative complications. Four patients had postoperative bleeding, 2 of whom required endoscopic management. All patients had negative margins on final pathology. Of the 37 people who were referred for completion re-excision after incomplete endoscopic removal, 7 patients (18.9%) had residual tumour on final pathology. Three recurrences were diagnosed at 2.1, 4.5, and 12.5 years, respectively, after TEM excision. All recurrences were originally grade 2 tumours < 2 cm and diagnosed radiographically. **Conclusion:** To date, this is the largest North American study looking at TEM for rectal NETs. Full-thickness TEM excision is effective in managing primary, endoscopically incompletely excised, and recurrent rectal NETs with good short-term postoperative outcome and low recurrence rates.

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The gut microbiota modulates colorectal anastomotic healing in patients undergoing surgery for colorectal cancer. ***Roy Hajjar*, *Gabriela Fragoso*, *Manon Oliero*, *Annie Calvé*, *Hervé Vennin Rendos*, *Emmanuel Gonzalez*, *Nicholas J.B. Brereton*, *Thibault Cuisiniere*, *Claire Gerkins*, *Souad Djediai*, *Borhane Annabi*, *Khoudia Diop*, *Bertrand Routy*, *Patrick Laplante*, *Jean-François Cailhier*, *Nassima Taleb*, *Hefzi Alratrout*, *François Dagbert*, *Rasmy Loungnarath*, *Herawaty Sebajang*, *Frank Schwenter*, *Ramses Wassef*, *Richard Ratelle*, *Eric Debroux*, *Carole Richard*, *Manuela M. Santos*. From Université de Montréal (Hajjar, Brereton, Santos), Institut du cancer de Montréal (Hajjar, Fragoso, Oliero, Calvé, Vennin Rendos, Cuisiniere, Diop, Routy, Laplante, Cailhier, Santos), Centre de recherche du Centre hospitalier de l'Université de Montréal (Hajjar, Fragoso, Oliero, Calvé, Vennin Rendos, Cuisiniere, Gerkins, Diop, Routy, Laplante, Cailhier, Santos), Canadian Centre for Computational Genomics (Gonzalez), McGill University (Gonzalez), Université du Québec à Montréal (Djediai, Annabi), and Centre hospitalier de l'Université de Montréal (Taleb, Alratrout, Dagbert, Loungnarath, Sebajang, Schwenter, Wassef, Ratelle, Debroux, Richard).**

Background: Anastomotic leak (AL) is a major complication in colorectal surgery and significantly increases morbidity and mortality. Our objective was to investigate the possible role of the gut microbiome in anastomotic healing. **Methods:** Preoperative fecal samples and intraoperative mucosal samples were collected from a cohort of patients with colorectal cancer (CRC). The gut microbiota of patients with AL and of other patients who presented optimal healing was analyzed and compared using the Anchor 16S rRNA gene amplicon pipeline. Fecal microbiota transplantation (FMT) was performed in mice using fecal samples from patients with and without AL. Transplanted mice underwent colonic surgery. Anastomotic healing and gut barrier integrity were evaluated 6 days later. Additionally, the gut microbiota composition was assessed to detect potential differences. **Results:** After surgery, mice transplanted with the fecal microbiota of donors with AL displayed poorer macroscopic healing of the anastomosis. They also displayed greater gut permeability, as judged by increased bacterial translocation to the spleen. Lower concentrations of collagen and fibronectin in these mice indicated poor extracellular matrix (ECM) formation at the wound site. A higher concentration of tumour necrosis factor α (TNF-α) was noted in the anastomotic tissue of mice colonized with the microbiota of patients with AL. This was accompanied by higher expression of collagenolytic enzymes involved in ECM degradation. Gut microbiota β-diversity was significantly different between the 2 groups and bacterial species were shown to be associated with the healing process. **Conclusion:** The gut microbiota in patients with poor postoperative healing induces poor healing in mice. These results suggest that the gut microbiota in patients with CRC may play a role in anastomotic healing after surgery.

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Is there added risk of complications for concomitant procedures during an ileocolic resection for Crohn disease? ***Alexa Ehlebracht*, *Doulia Hamad*, *Hatim Alsulaim*, *Olivia Monton*, *Daniel Marinescu*, *Allison Pang*, *Carol-Ann Vasilevsky*, *Marylise Boutros*. From McGill University (Ehlebracht, Alsulaim, Monton, Marinescu, Pang, Vasilevsky, Boutros) and University of Toronto (Hamad).**

Background: Most Crohn disease (CD) patients require surgical management within their lifetime; this study compares outcomes in CD patients undergoing ileocolic resection (IR) v. IR and concomitant procedure. **Methods:** After institutional review board approval, we performed a cohort study using the American College of Surgeons National Surgical Quality Improvement Program database for patients with CD who underwent IR or IR with a concomitant procedure (abdominal abscess drainage, enterocutaneous fistula repair, second bowel resection, and stricturoplasty) between 2012 and 2019. The primary outcome of interest was surgical site infections (SSIs). The secondary outcomes were postoperative length of stay, anastomotic leak rate, reoperation rate, 30-day mortality, and 30-day morbidity. Multivariate logistic regression was then used to investigate the association of IR with concomitant procedure and these outcomes. **Results:** Of 6724 patients, 5990 (89.1%) and 734 (10.9%) underwent IR and IR with a concomitant procedure, respectively. The mean age was 40.4 ± 15.3 years, 46.4% were male and 49.8% were immunosuppressed. On univariate analysis, patients who underwent IR with a concomitant procedure were younger (38.3 v. 40.6 yr, $p = 0.001$) compared with patients with IR alone. Patients with IR and concomitant procedure had a higher rate of overall SSIs (15.8% v. 12.6% $p = 0.02$), organ space SSI (8.4% v. 6.1%, $p = 0.02$), systemic sepsis (8.7% v. 6.1%, $p = 0.01$) and longer length of stay. On multiple logistic regression, after accounting for relevant confounders, IR with a concomitant procedure was not significantly associated with overall SSIs (odds ratio [OR] 1.028, 95% confidence interval [CI] 0.768–1.376) compared with IR alone. Age (OR 0.992, 95% CI 0.985–0.999), body mass index (OR 1.035, 95% CI 1.021–1.05), open approach (OR 0.624, 95% CI 0.512–0.761), smoking (OR 1.5, 95% CI 1.233–1.826), transfusion (OR 2.154, 95% CI 1.563–2.97), and dirty wound class (OR 1.393, 95% CI 1.081–1.796) were independently associated with SSI. Similarly, IR with concomitant procedure was not independently associated with organ space SSI (OR 1.069, 95% CI 0.73–1.564), major morbidity (OR 0.819, 95% CI 0.571–1.176), or mortality (OR 1.49, 95% CI 0.249–8.909). IR with a concomitant procedure was, however, associated with a longer length of stay (β = 0.1375, 95% CI 0.037–0.238) as compared with IR alone. **Conclusion:** Adding a concomitant procedure when performing an IR for patients with CD did not increase the risk of SSI, reoperation, anastomotic leak, or major morbidity and mortality. However, specific patient, disease, and operative factors did impact these outcomes. IR with concomitant procedure was associated with significantly longer hospital stay compared with IR alone.

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Cost of stoma-related hospital readmissions for rectal cancer patients following restorative proctectomy with a diverting loop ileostomy: a nationwide readmissions database analysis. ***Natasha Caminsky*, *Daniel Marinescu*, *Mohammed Alqabtani*, *Allison Pang*, *Gabriela Ghitulescu*, *Carol-Ann Vasilevsky*, *Marylise Boutros*. From McGill University.**

Background: Rectal cancer patients often undergo creation of a diverting loop ileostomy (DLI) to prevent the clinical consequences of an anastomotic leak. Stomas are not without their own complications; however, few studies have investigated the associated costs. This study aimed to characterize long-term risks for readmission with stoma-related complications and their concomitant costs. **Methods:** Through a retrospective cohort study using the Nationwide Readmissions Database, adult patients admitted with a rectal neoplasm (*International Classification of Diseases* (ICD)-9/10 codes) who underwent restorative proctectomy (RP) with DLI (2010–2018) were identified. The date of RP and DLI defined cohort entry. Six months post-RP and DLI or the time of DLI closure (whichever came first) defined cohort exit. Main outcome measures were emergency readmission for stoma-related complications (ICD-9/10 codes) and total cost of care (index admission for RP and DLI + readmission). Multivariate logistic and linear regression were used to identify risk factors and cost of readmission. **Results:** Of 12 027 patients with RP and DLI, 9.5% ($n = 1148$) were emergently readmitted for stoma-related complications: dehydration

and acute renal failure (83.0%), hernia with obstruction (6.6%), and stoma malfunction (6.1%). Patients readmitted with stoma-related complications were significantly older (62.5 ± 11.2 yr v. 59.1 ± 12.0 yr [no readmission] v. 57.8 ± 11.9 yr [readmission for non-stoma-related complications], $p < 0.0001$). On multiple logistic regression, factors independently associated with stoma-related complications included female gender (odds ratio [OR] 1.21, 95% confidence interval [CI] 1.07–1.38), chronic blood loss (OR 1.57, 95% CI 1.01–2.45), depression (OR 1.39, 95% CI 1.12–1.74), and diabetes (OR 1.94, 95% CI 1.48–2.53). Stoma-related complications requiring readmission independently increased total cost of care by $55 443.37 (95% CI $55 443.31–$55 443.43) v. $47 101.30 (95% CI $47 101.23–$47 101.37) for non-stoma-related complication readmissions. **Conclusion:** Readmissions for stoma-related complications following RP and DLI are common and represent a substantial proportion of the rectal cancer patients' total cost of care. Increased support and consideration of selective early ileostomy closure could help reduce the financial burden on patients and the health care system.

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Older age associated with quality of rectal cancer care: an ACS-NSQIP database study. ***Natasha Caminsky*, *Daniel Marinescu*, *Richard Garfinkle*, *Marylise Boutros*. From McGill University.**

Background: Rectal cancer surgery requires adherence to specific multidisciplinary preoperative, intraoperative, and postoperative elements of care. Compliance with all 6 preoperative elements available in the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database has been associated with better surgical and oncologic outcomes. This study aimed to identify sociodemographic factors associated with rectal cancer checklist compliance. **Methods:** This was a retrospective cohort study of adult rectal cancer patients in the ACS-NSQIP database who underwent elective surgery between 2016 and 2019. The main outcome was compliance with all 6 preoperative checklist elements (complete evaluation of colon, pretreatment tumour location, pretreatment locoregional and distant staging, appropriate use of neoadjuvant radiotherapy, preoperative stoma marking). Multiple logistic regression was used to identify sociodemographic factors associated with checklist compliance while accounting for relevant clinical factors. **Results:** A total of 5428 patients met inclusion criteria and only 22.6% ($n = 1228$) were compliant with all 6 checklist items. Elderly patients (≥ 70 yr, $n = 1545$) had significantly lower compliance (18.1% v. 24.4%) than those aged < 70 years ($p \leq 0.0001$). Compliance with individual checklist items in this group was lowest for neoadjuvant radiation therapy for ≥ T3 or node-positive disease (25.3%), and pretreatment locoregional and distant staging (65.2% and 53.4%, respectively). Multiple logistic regression estimated a 2% decrease in odds of checklist compliance with every year increase in age (odds ratio 0.977, 95% confidence interval 0.969–0.984). **Conclusion:** Elderly (≥ 70 yr) patients require more attention when it comes to preoperative investigations and interventions before rectal cancer surgery, specifically appropriate preoperative staging.

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Outcomes of patients undergoing elective bowel resection before and after implementation of an anemia screening and treatment program. ***Richard Gilbert*, *Terry Zwiep*, *Joshua Greenberg*, *Tori Lenet*, *Reilly Musselman*, *Lara Williams*, *Isabelle Raiche*, *Daniel McIsaac*, *Kednapa Thavorn*, *Dean Fergusson*, *Husein Moloo*. From The Ottawa Hospital (Gilbert, Lenet, Musselman, Williams, Raiche, McIsaac, Thavorn, Fergusson, Moloo), London Health Sciences Centre (Zwiep), and Orillia Soldiers Memorial Hospital (Greenberg).**

Background: Anemic patients undergoing elective colorectal cancer surgery are known to have significantly higher rates of postoperative complications and worse outcomes. Our objective was to improve rates of anemia screening and treatment in patients undergoing elective colon and rectal resections through a quality-improvement initiative. **Methods:** We compared a historical cohort of patients before implementation of our anemia screening and treatment quality-improvement program to a prospective cohort following implementation. The primary outcome was hospital cost per admission. **Results:** A total of 84 patients underwent elective colon or rectal resection before implementation of our anemia quality-improvement project and 88 patients underwent surgery after. In the preimplementation cohort, 44 of 84 (55.9%) were anemic, compared with 47 of 99 (54.7%) in the postimplementation cohort. Rates of screening (25%–86.4%) and treatment (27.8%–63.8%) were significantly increased in the postimplementation cohort. Mean total cost per admission was significantly decreased in the postimplementation cohort (mean cost $16 827 v. $25 796, $p = 0.004$); this significant reduction was observed even after adjusting for relevant confounding factors (ratio of means 0.74, 95% confidence interval 0.65–0.85). The mechanistic link between treatment of anemia and reductions in cost remains unknown. There was no significant difference in rates of blood transfusion, complications, or mortality between the groups. **Conclusion:** This study is limited by its before–after design, which is subject to selection and temporal biases. We demonstrate the successful implementation of an anemia screening and treatment program. This program was associated with significantly reduced cost per admission. This work demonstrates possible value and benefits from implementation of an anemia screening and treatment program.

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Loop ileostomy closure as a 23-hour stay procedure: a randomized controlled trial. ***Geneviève Morin*, *Janyssa Charbonneau*, *Xavier Paré*, *Jonathan Frigault*, *François Letarte*. From CHU de Québec — Université Laval.**

Background: Loop ileostomy closure is associated with low complication rates, consisting mostly of postoperative ileus, but is still leading to significant length of hospitalization. Hence, decreased length of stay could be achieved by decreasing ileus rates. The purpose of this study was to assess the safety and feasibility of ileostomy closure performed in a 23-hour hospitalization setting using a standardized enhanced recovery pathway. **Methods:** This randomized controlled trial

included healthy adults undergoing elective ileostomy closure. All patients were enrolled in a standardized enhanced recovery pathway specific to ileostomy closure, including daily irrigation of the efferent limb with an enteral nutritional formula for 7 days preoperatively. Once surgery was completed, patients were randomized to either conventional hospitalization (CH) or to 23-hour stay (23HS). Primary outcome was total length of stay in days, and secondary outcomes were 30-day rates of readmission, postoperative ileus, surgical site infection, postoperative morbidity and mortality. Owing to COVID-19 limiting access to surgical beds, the study was terminated early. **Results:** A total of 47 patients were randomized; 23 in the CH arm and 24 in the 23HS arm. Patients in the 23HS arm had a shorter median length of stay (1 d v. 2 d, $p = 0.015$) and similar readmission rates (4% v. 13%, $p = 0.348$), postoperative ileus (0% in both arms), surgical site infection (0% v. 4%, $p = 0.489$), postoperative morbidity rates (17% v. 22%, $p = 0.724$) and mortality rate (0% in both arms). **Conclusion:** This study suggests that loop ileostomy closure as a 23-hour stay procedure in a standardized enhanced recovery pathway is feasible and safe.

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Extended duration perioperative thromboprophylaxis with low-molecular-weight heparin to improve disease-free survival following surgical resection of colorectal cancer: a multicentre randomized controlled trial (PERIOP-01 Trial). ***Rebecca C. Auer*, *Michael Ott*, *Paul Karanicolas*, *Muriel Brackstone*, *Shady Ashmalla*, *Joel Weaver*, *Vicky Tagalakis*, *Marylise Boutros*, *Peter Stotland*, *Antonio Caycedo-Marulanda*, *Husein Moloo*, *Shiva Jayaraman*, *Sunil Patel*, *Gregoire LeGal*, *Silvana Spadafora*, *Steven Maclellan*, *Daniel Trottier*, *Derek Jonker*, *Timothy Asmis*, *Ranjeeta Mallick*, *Timothy Ramsay*, *Marc Carrier*. From The Ottawa Hospital Research Institute (Auer, Moloo, LeGal, Jonker, Asmis, Mallick, Ramsay, Carrier), University of Ottawa (Auer, Moloo, Jonker, Asmis, Carrier), London Health Sciences Centre (Ott, Brackstone), Western University (Ott, Brackstone), Sunnybrook Health Sciences Centre (Karanicolas, Ashmalla), University of Toronto (Karanicolas, Ashmalla, Stotland, Jayaraman), Queensway Carleton Hospital (Weaver), Lady Davis Institute for Medical Research (Tagalakis, Boutros), McGill University (Tagalakis, Boutros), North York General Hospital (Stotland), Kingston Health Sciences Centre (Caycedo-Marulanda, Patel), Queen's University (Caycedo-Marulanda, Patel), St. Joseph's Health Centre (Jayaraman), Montfort Hospital (LeGal, Trottier), Sault Area Hospital (Spadafora), and Humber River Hospital (Maclellan).**

Background: Cancer patients undergoing surgical resection of their tumour are hypercoagulable beyond the period of hospitalization. Preclinical studies demonstrate that the postoperative hypercoagulable state promotes metastases, an effect that is abrogated by administration of perioperative low-molecular-weight heparin (LMWH). **Methods:** We conducted a randomized open-label clinical trial (Funded by Canadian Institute of Health Research and Leo Pharma; ClinicalTrials.gov NCT 01455831) to determine if extended duration thromboprophylaxis using subcutaneous LMWH (tinzaparin 4500 IU daily), beginning at decision to operate and continuing for 56 days postoperatively, compared with inpatient postoperative thromboprophylaxis only, increased the 3-year disease-free survival (DSF) in patients undergoing resection for colorectal cancer. Secondary outcomes included 5-year overall survival (OS), postoperative bleeding and venous thromboembolism (VTE). **Results:** Trial recruitment was stopped prematurely after 614 of the planned 1075 patients were registered, following a predefined interim analysis for futility. The intention-to-treat analysis included 602 patients. The 3-year DFS was 78.9% (63 of 299 recurrences) in the tinzaparin group and 80.5% (59 of 303 recurrences) in the control group (hazard ratio [HR] 1.09, 95% confidence interval [CI] 0.91–1.31, $p = 0.3$). The 5-year OS was 91.3% in the tinzaparin group and 92.4% in the control group (HR 1.08, 95% CI 0.66–1.79, $p = 0.1$). The incidence of postoperative VTE was 1.7% and 1.3% in the tinzaparin and control groups, respectively (HR 1.3, 95% CI 0.30–5.69, $p = 0.7$). The incidence of major bleeding in the first postoperative week was 0.3% and 2% in the tinzaparin and control groups, respectively (HR 0.16, 95% CI 0.02–1.15, $p = 0.07$). **Conclusion:** Extended-duration perioperative anticoagulation with tinzaparin did not improve DFS or OS in colorectal cancer patients undergoing surgical resection. The incidences of postoperative bleeding and VTE were low.

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Three-stage versus modified 2-stage ileal pouch anal anastomosis: perioperative outcomes, function and quality of life. ***Terry Phang*, *Delaram Shojaei*, *Ali Motamedi*, *Anu Ghuman*, *Ahmer Karimuddin*, *Manoj Raval*, *Carl Brown*, *Delaram Shojaei*. From University of British Columbia (Phang, Shojaei, Ghuman, Karimuddin, Raval, Brown, Shojaei) and University of Toronto (Motamedi).**

Background: Ileal pouch anal anastomosis (IPAA) restores continuity of the intestinal tract as an alternative to a permanent ileostomy. IPAA is commonly done in 3 stages: colectomy with ileosotmy, proctectomy with IPPA and diverting ileostomy, and ileostomy closure. A diverting ileostomy is used as a preventative measure for anastomotic leak but requires a third operation. The modified 2-stage IPPA omits the diverting ileostomy after IPPA. **Methods:** We compared 3-stage v. modified 2-stage IPAA for perioperative outcomes, function, and quality of life (QoL) from chart review and questionnaire-based evaluation of function (pouch functional score) and QoL (EQ-5D-3L). **Results:** In total, 109 3-stage and 43 2-stage IPPA were performed at a single institution between 2010 and 2020, with follow-up of 2074 days for 3-stage and 2057 days for 2-stage. There was no difference between 3-stage and 2-stage in anastomotic leak (1 v. 0), or pouch failure/excision/permanent ileostomy (1 v. 0). Perioperative complications were more frequent in 3-stage than 2-stage (78% v. 19%, NS). Clavien–Dindo complications were similar for 3-stage and 2-stage (3A [pelvic abscess]: 5.5% v. 4.7%; 3B or higher: 36% v. 20%, NS). Postoperative small bowel obstruction after IPAA was more frequent in 3-stage than 2-stage (15% v. 4%, $p = 0.05$). Hospital stay for IPPA and complications was greater for

3-stage than 2-stage (mean 26 v. 12 d, NS). There was no difference in pouchitis requiring antibiotics (6% v. 7%), number of bowel movements per day (8 + 3 v. 7 + 1) or QoL score (73 + 17 v. 75 + 15). **Conclusion:** Two-stage IPPA is not associated with increased anastomotic leak or complications and has less occurrence of postoperative bowel obstruction compared with IPPA with diverting ileostomy. There was no advantage for 3-stage IPPA in pouchitis, function or QoL. Within limitations of this review, a diverting ileostomy may provide protection for a questionable IPPA but does not need to be routine.

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Compliance with extended venous thromboembolism prophylaxis in rectal cancer. *Jessica Hopkins*, *Haili Wang*, *Don Buie*. From University of Calgary (Hopkins, Buie) and University of Alberta (Wang).

Background: Extended-duration venous thromboembolism prophylaxis (VTEp) is recommended after colorectal cancer resection. **Methods:** As part of a quality initiative, provincial data were used to determine compliance with VTEp and to identify high-risk patients. All patients who underwent proctectomy for rectal cancer in 2012, 2017 and 2019 were included. Compliance was defined as a prescription for VTEp and discharged home within 28 days postoperatively in patients not already therapeutically anticoagulated. Data collection included demographics, length of stay (days), hospital size (< or > 300 beds), comorbidities (Charlson Comorbidity Index), medications (VTEp/anticoagulation), disease stage (TNM) and 90-day VTE rate. Data were compared using analysis of variance and Fisher exact test. Logistic regression was used to identify predictors of compliance and 90-day VTE. **Results:** We identified 1240 patients. Compliance improved over time, from 25.9% in 2012 to 63.7% in 2017 and 71.6% in 2019 ($p < 0.001$). Year of diagnosis (2017: odds ratio [OR] 3.39, $p < 0.001$; 2019: OR 5.69, $p < 0.001$), stage IV disease (OR 6.25, $p = 0.037$) and hospital size > 300 beds (OR 3.27, $p < 0.001$) were predictive of VTEp compliance in univariate analysis. In multivariate analysis, year of diagnosis (2017: OR 2.28, $p < 0.001$; 2019: OR 3.78, $p < 0.001$), stage IV disease (OR 2.37, $p = 0.004$) and hospital size > 300 beds (OR 3.84, $p < 0.001$) all predicted increased likelihood of VTEp. Overall 90-day VTE rates were 3.2%, 1.3% and 2.9% in 2012, 2017 and 2019 ($p = 0.174$), respectively. The 90-day VTE rate was similar despite VTEp (2.9 v. 2.2%, $p = 0.26$). Year of diagnosis (2017: OR 0.30, $p = 0.034$) and stage IV disease (OR 11.2, $p = 0.032$) were statistically significant predictors of 90-day VTE in multivariate analysis, while VTEp was nonsignificant (OR 0.73, $p = 0.475$). **Conclusion:** Compliance with VTEp is high across most sites and has improved over time. Quality improvement initiatives should emphasize compliance in those with stage IV disease.

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Extended-duration venous thromboembolism prophylaxis after diversion in rectal cancer. *Jessica Hopkins*, *Haili Wang*, *Don Buie*. From University of Calgary (Hopkins, Buie) and University of Alberta (Wang).

Background: Locally advanced or metastatic disease is a known risk factor for venous thromboembolism. While compliance with extended-duration venous thromboembolism prophylaxis (VTEp) after curative proctectomy for rectal cancer is high, it is unclear whether patients who undergo diversion or noncurative resection before neoadjuvant or palliative therapy are routinely prescribed VTEp. **Methods:** Using a provincial database, patients with a noncurative surgical intervention for rectal cancer in the years 2012, 2017 and 2019 were identified. Compliance was defined as a prescription for VTEp and discharge home within 28 days postoperatively in patients not already therapeutically anticoagulated. Demographics, length of stay, hospital size (< 300 or > 300 beds), comorbidities (Charlson Comorbidity Index), disease stage (TNM), medications (VTEp/anticoagulation) and 90-day VTE rate were collected. Data were compared using Fisher exact test and analysis of variance. Logistic regression was used to identify predictors of VTEp compliance. **Results:** We identified 115 patients, of whom 54.8% had stage IV disease and 27.0% underwent subsequent definitive resection. Overall, 89.5% were diverted, with most receiving loop colostomy (64.3%). The incidence of 90-day VTE was 2.6% (3 of 115). Use of VTEp was low, with compliance of 17.9%, 34.8% and 21.4% in 2012, 2017 and 2019, respectively ($p = 0.058$). In univariate analysis, stage IV disease (odds ratio [OR] 0.31, $p = 0.030$) was predictive of no VTEp across all time points. Patients who later underwent neoadjuvant therapy followed by a curative resection were no more likely to receive VTEp (OR 0.73, $p = 0.451$). In multivariate analysis, those with stage III (OR 0.25, $p = 0.041$) and IV (OR 0.23, $p = 0.019$) disease or at a hospital with < 300 beds (OR 0.30, $p = 0.049$) were significantly less likely to receive VTEp. **Conclusion:** Despite a pre-existing risk factor for VTE, patients with locally advanced and metastatic disease were less likely to receive VTEp. Patients with elevated VTE risk and ongoing need for therapeutic interventions should be identified and considered for extended VTEp.

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Financial and occupational impact of low anterior resection syndrome: a qualitative study. *Yosef Levin*, *Nasra Al Busaidi*, *Fateme Rajabiyazdi*, *Marie Demian*, *Marylise Boutros*. From McGill University (Levin, Al Busaidi, Demian, Boutros) and Carleton University (Rajabiyazdi).

Background: Low anterior resection syndrome (LARS), a sequela of restorative proctectomy, is known to impact quality of life. Limited studies have explored the effect on patients' finances and occupation. Our goal was to explore the lasting impacts of LARS-driven financial and occupational burden. **Methods:** A qualitative study was conducted at a single tertiary care centre using semistructured interviews with rectal cancer survivors. Selected participants had been working before their rectal cancer diagnosis and were previously identified to have major LARS. Open-ended interview questions were developed to explore the financial and occupational impacts of LARS. Transcribed interviews were coded independently by 2 trained researchers and the identified themes were refined iteratively based on continuing discussions with all investigators. Seven participants were recruited

to participate. **Results:** The median age at rectal cancer diagnosis was 53 (interquartile range 12.5) years; 5 of the participants (71%) were female. Patient interviews revealed 3 overarching topics with key themes. 1) Coping with LARS symptoms impacts daily routine and makes a return to work challenging. The key themes were that daily activities are more difficult while dealing with LARS; LARS symptoms are mentally straining; and family/social support is one the most important components of dealing with LARS-induced stress. 2) The inability to return to work creates a difficult financial situation. The key themes were that financial stress and strain are important sequelae of major LARS; and LARS forced an occupational adaption that is hard to accommodate. 3) Patients experience inadequate access to services while coping with LARS and financial distress. The key theme was that limited access to necessary services is an important barrier to overcoming/living with major LARS. **Conclusion:** Major LARS patients often experience new financial and occupational burdens. Improving access to necessary services during survivorship may help lessen the burden of living with LARS.

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Nonoperative management for rectal cancer: patient perspectives. ***Armaghan Alam, Ameer Farooq, Carl Brown, Terry Phang, Amandeep Ghuman, Ahmer Karimuddin, Manoj Raval, Farhad Udwadia.*** **From the University of British Columbia.**

Background: Patients with rectal cancer are predominantly managed with total mesorectal excision, which can be associated with significant morbidity and mortality. As a result, stakeholders have sought alternative and novel strategies to manage patients, including local excision and nonoperative management (NOM). While NOM spares radical surgery, it does not come without certain challenges. These include a lack of established criteria to identify patients, rigorous follow-up, and the psychological burden of a "watchful waiting" approach. **Methods:** Using purposive sampling methods we recruited rectal cancer patients who underwent NOM from a single institution. Semistructured interviews were conducted with these patients and analyzed qualitatively using the constant comparative approach. **Results:** Twelve patients who met the inclusion criteria were recruited from across British Columbia. The cohort included patients from both genders (7 male, 5 female) between the ages of 36 and 88 years. Four major thematic categories emerged from the interviews: impact of rectal cancer, treatment values, decision-making factors, and impact of NOM pathway. For the impact of rectal cancer category, the psychological impact emerged as a dominant theme (10 of 12), with the effects of chemotherapy being secondary. With regards to treatment values, 10 of 12 patients stated being ostomy-free was of primary importance, with survival emerging as a secondary theme. The dominant theme in decision-making factors was avoidance of an ostomy (10 of 12), with trust in physician being secondary. Finally, with regards to the impact of NOM, the psychological impact emerged as a dominant theme (11 of 12). Overall, 11 of 12 participants expressed satisfaction with this pathway. **Conclusion:** The psychological impact and burden of chemotherapy were the most cited difficulties with regards to initial management of rectal cancer. Avoiding an ostomy was a dominant treatment value, as well as an important decision-making factor in favour of NOM. Despite the psychological burden associated with this novel approach, patients were satisfied with their choice.

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Trends in ileostomy-related emergency department visits for rectal cancer patients. ***Natasha Caminsky, Daniel Marinescu, Mohammed Alqahtani, Allison Pang, Carol-Ann Vasilevsky, Marylise Boutros.*** **From McGill University.**

Background: Many rectal cancer patients with diverting loop ileostomies (DLIs) will experience stoma-related complications requiring emergency department (ED) visits and readmission. The aim of this study was to describe trends in ED visits and readmissions for stoma-related complications over time. **Methods:** The Nationwide Emergency Department Sample Database was used to identify adult patients with a primary rectal neoplasm (*International Classification of Diseases* 9/10 codes) who visited the ED with a stoma-related complication between 2006 and 2018. Main outcome measures were rate of admission from ED, DLI closure during admission, and total hospital cost (cost for ED ± inpatient care). Multivariate logistic regression was used to identify risk factors for admission from ED. **Results:** Of the 13 274 patients, 11 368 (85.6%) were admitted to hospital, while the remainder were discharged from ED. From 2006 to 2018, the proportion of patients admitted from ED with stoma-related complications declined, from 90.4% (95% confidence interval [CI] 89.2%–91.5%) to 81.3% (95% CI 80.1%–82.5%). Admitted patients were older (66.3 ± 13.6 v. 61.9 ± 13.7 yr, $p < 0.001$) and more often male (58.7% v. 53.3%, $p < 0.0001$). Acute renal failure/dehydration was the most common reason for ED visits (77.0%) and admission from ED (89.2%). Nearly all patients admitted to the hospital left without having their stoma closed (99.2%). On multivariate analysis, age (odds raio [OR] 1.016, 95% CI 1.011–1.021), weight loss (OR 6.75, 95% CI 5.22–8.75), metastatic disease (OR 2.77, 95% CI 2.44–3.13), anemia (OR 2.62, 95% CI 2.16–3.18), and mental health disorders (OR 2.52, 95% CI 1.99–3.20) were the strongest predictors of admission from the ED. While ED stay is greater for patients discharged home ($3576.50, interquartile range [IQR] $1876–$7922.50 v. $1570.50, IQR $962–$2434), total cost of care for admitted patients is substantially greater ($27 564, IQR $14 882–$54 053). **Conclusion:** Most rectal cancer patients are admitted from the ED with stoma-related complications, placing an important burden on the health care system. New approaches are needed to prevent these presentations and better treat them in the ED when they do present.

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Long-term implications of treatment of fecal incontinence: a single Canadian centre's retrospective cohort study: a 17-year follow-up. ***Sarah Mansouri, Sonia Cheng Oviedo, Nathalie McFadden.*** **From Université de Sherbrooke.**

Background: Fecal incontinence (FI) is a frequent medical condition, although mostly underreported. It impedes on the quality of life of the patients suffering from this debilitating condition. This patient population represents a heterogeneous group, and their medical journey and long-term outcomes are not well described in the Canadian context. The purpose of our study was to describe the characteristics of patients with FI referred at our institution and to report their medical evolution over a long follow-up period of 17 years. **Methods:** Two Canadian university-affiliated centres were included. This study included all adult patients referred to our institutions with a diagnosis of FI between 2002 and 2019. Patient demographic characteristics, treatment modalities and serial Wexner incontinence scores and quality-of-life measurements were recorded prospectively. Favourable outcome was defined as an improvement in the Wexner score in time. **Results:** A total of 226 patients were included in this study. Mean follow-up was 41.68 ± 42.00 months. Mean Wexner score on initial evaluation was 14.24 ± 4.42. On initial evaluation, 94.7% of patients chose to have a treatment. The most common first-line treatment was nonsurgical, noninvasive treatments (58.6%), including modification of dietary habits, antidiarrheic agents, bulking agents, biofeedback, and physical therapy. More invasive strategies, like surgery and sacral nerve modulation, as first line therapy were used in 21% and 14.5% of patients, respectively. Following first treatment, mean Wexner score was 6.39. A second treatment was required in 64% of patients. The most common second-line modality was sacral nerve modulation (27.3%). Mean Wexner score following second treatment was 7.24. A third treatment was required in 45% of patients. The most used third therapeutic modality was sacral nerve modulation. Mean Wexner score following third treatment was 6.62. At the end of the study, mean Wexner score at last follow-up was 5.40, which was both clinically and statistically significant. **Conclusion:** These findings suggest that patients with FI can be managed effectively with nonsurgical, noninvasive treatments and/or sacral nerve modulation but necessitate a multimodal approach. These modalities do improve symptoms significantly. More importantly, this favourable evolution seems to be sustained over the long follow-up period of 17 years in this study.

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Externally benchmarking colorectal resection outcomes in our province against the ACS NSQIP risk calculator: identifying opportunities for improvement. *Philip Lagace*, *Richard Spence*, *Greg Hirsch*, *Katerina Neumann*. From Dalhousie University.

Background: Administrative data suggest our provincial colectomy outcomes are worse than the national average. These data sets are not risk adjusted. We aimed to interrogate this further by generating risk-adjusted comparisons of our provincial outcomes against the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP). **Methods:** Ten of 12 sites across our province participated in the ACS NSQIP procedure-targeted program, capturing all colectomy and proctectomy cases since January 2021. Using the online ACS NSQIP calculator, we generated external benchmarking for our inaugural 6 months of data. ACS NSQIP surgical risk scores were calculated for each patient. Relative risk of observed events in our cohort as compared with the expected event rate predicted by the NSQIP risk calculator was determined for the primary outcome of 30-day mortality and secondary outcomes including any morbidity as well as individual morbidities. Observed and expected length of stay (LOS) was compared using paired *t* test. **Results:** For 444 colorectal resections between January and June 2021, 30-day mortality was 4.73% (95% confidence interval [CI] 2.95–7.14), and complications within 30 days were recorded in 150 (33.78%) patients. The relative risk of death in our cohort, as compared with the predictions from ACS NSQIP, was 1.24 (95% CI 0.66–2.31, $p = 0.508$). The relative risk of any morbidity was 1.5 (95% CI 1.21–1.86, $p = 0.0002$). Of the possible complications in the NSQIP calculator, only the relative risk for surgical site infection (SSI) (1.83, 95% CI 1.29–2.61, $p = 0.0007$) and postoperative sepsis (2.5, 95% CI 1.42–4.40, $p = 0.0015$) was significantly greater than 1. LOS was increased by 1.63 days from 7.46 days, as predicted by the ACS NSQIP calculator (95% CI 0.95–2.32, $p = 0.0001$). **Conclusion:** After externally benchmarking our colorectal resection outcomes against risk-adjusted data from ACS NSQIP, we have identified a higher-than-expected rate of overall morbidity, SSI, and postoperative sepsis, with no significant increase in 30-day mortality.

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Externally benchmarking our provincial colectomy outcomes against the ACS NSQIP using the Codman Score: to identify possible opportunities for improvement of outcomes. *Philip Lagace*, *Katerina Neumann*, *Richard Spence*. From Dalhousie University.

Background: The 10-point Codman Score is a risk-prediction rule that provides external benchmarking against the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP). **Methods:** We applied the Codman Score to the first 6 months of colectomy outcomes data from the ACS NSQIP pilot in our province's health authority. We collected 100% provincial colectomy procedures in ACS NSQIP in January 2021. A descriptive analysis was performed on the inaugural 6-month cohort. A 10-point Codman Score was calculated for each patient. The predictive performance of the Codman Score was calculated for the primary outcome of death and secondary outcome of morbidities, using area under the receiver operating characteristics curve (AUC) analysis. External benchmarking comparisons using risk-adjusted observed v. expected ratios (O/E) were calculated for the primary and secondary outcomes using a Poisson confidence interval calculator. A Codman cutoff of 8 was used to identify unexpected successes and failures to explore possible opportunities for improvement. **Results:** During the period January–June 2021, for 444 colectomy procedures, 30-day mortality was 4.73% (95% confidence interval [CI] 2.95–7.14), and complications within 30 days were recorded in 150 (33.78%) patients. A Codman Score was calculated for 444 (100%) patients (median 4, interquartile range 2–5). The predictive ability of the Codman Score was 0.84 (95% CI 0.76–0.92) for death and 0.67 (95% CI 0.62–0.73)

for morbidity. The risk adjusted O/E was 1.31 (95% CI 0.81–2.0) for death and 1.44 (95% CI 1.22–1.69) for morbidities. **Conclusion:** Applying the Codman prediction rule to our inaugural colectomy data set demonstrated excellent predictive performance, and identified a significantly higher morbidity rate but not mortality rate to the ACS NSQIP. Further enquiry into the unexpected outcomes identified may offer opportunities for quality improvement.

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Rural v. urban documentation of recommended practices for optimal endoscopic colorectal lesion localization. ***Charbel El-Kefraoui, Garrett Johnson, Harminder Singh, Ramzi Helewa*. From the University of Manitoba.**

Background: Colonoscopy is the standard of care for diagnosing and locating colorectal neoplasms before surgery. Endoscopies are often repeated before surgery owing to nonstandard practices. Repeat endoscopies may result in treatment delays and may increase risks of colonoscopy-related complications. Consensus recommendations were recently developed for optimal endoscopic colorectal lesion localization. The aim of this project was to assess the extent to which colonoscopy practices differ from the new recommendations and to assess for variability in report quality between urban and rural referral sites. **Methods:** A retrospective review was conducted from randomly selected patients who underwent elective surgery for colorectal neoplasms at a single large tertiary care site in central Canada between 2007 and 2020. Endoscopy report quality was evaluated against the new recommendations. Charts were stratified by endoscopy location (rural v. urban). Primary outcomes were overall report completeness and appropriate use of recommended practices (tattoos, photographs). **Results:** A total of 194 patients were included (97 rural, 97 urban). The mean overall compliance with the recommendations for urban endoscopies was significantly better compared with rural (50% v. 48%, $p = 0.04$). Sixty-eight percent of the reports appropriately tattooed lesions (72% urban, 63% rural, $p = 0.16$). On average, reports included 29% of recommended tattoo information (30% urban, 28% rural, $p = 0.25$) and demonstrated 74% appropriate technique (70% urban, 81% rural, $p = 0.10$). In total, 21% of reports included photographs of lesions in accordance with the consensus recommendations (28% urban, 13% rural, $p = 0.01$). **Conclusion:** Endoscopies frequently omit recommended practices for optimal colorectal lesion localization. Rural reports more frequently omit recommended localization practices and documentation information compared with those generated in urban centres. Future research is needed to understand why these differences occur and facilitate high-quality endoscopy reporting for patients regardless of endoscopy location.

CANADIAN HERNIA SOCIETY

01

Incidence of in-hospital opioid use and pain after inguinal hernia repair. ***Marguerite Mainprize, Ayse Yilbas, Fernando Spencer Netto, Joel Katz*. From the Shouldice Hospital.**

Background: The objective of this study was to describe opioid use and pain intensity after inguinal hernia repair in a single-centre specialty hospital. **Methods:** The data are part of a larger ongoing prospective cohort study of healthy patients undergoing a primary unilateral inguinal hernia repair. After obtaining research ethics board approval and patient consent, 422 patients (mean age ± standard deviation [SD] 57.5 ± 14.2; mean body mass index ± SD 25.3 ± 2.6; *n* males = 407) undergoing unilateral inguinal hernia repair participated. **Results:** Most of the patients received multimodal nonopioid medication, with 8% ($n = 33$) receiving opioids (oral morphine, codeine, and oxycodone) within their 3-day postoperative hospital stay. The average daily dose in milligram morphine equivalents was 11.2 mg on the day of operation after surgery, 25.6 mg 1 day after surgery, and 16.8 mg 2 days after surgery. There was no record of opioids being administered at the 3-day postoperative time point. The prevalence of preoperative pain in the participants who received opioids postoperatively (67%, $n = 22$) did not differ significantly from that of participants who were opioid free after surgery (68%, $n = 264$). Median preoperative scores on a 0–10 numeric rating scale (NRS) for pain intensity differed significantly between participants who were given opioids after surgery (median ± interquartile range [IQR] 1.5 ± 2.75) and those who were not given opioids (median ± IQR 1 ± 2) ($p = 0.03$). Median NRS pain scores across the 3-day postoperative period were also significantly higher in the patients who had taken opioids after surgery (median ± IQR 3 ± 2.5) than in those who were opioid-free (median ± IQR 2 ± 2) ($p = 0.002$). On day 3 after surgery, 7% ($n = 2$) of the participants who took opioids postoperatively reported having returned to normal activities, whereas 15% ($n = 48$) of those who had not taken opioids postoperatively reported having returned to normal activities ($p < 0.05$). **Conclusion:** Under specialized care with perioperative patient counselling on postoperative pain management, the vast majority of patients undergoing primary unilateral inguinal hernia have effective pain control with nonopioid multimodal analgesia and only a minority require oral opioids.

02

Ventral hernia repair following liver transplantation: outcome of repair techniques and risk factors for recurrence. ***Megan Melland-Smith, Bree Sharma, Usman Khan, Markus Selzner*. From University of Toronto (Melland-Smith, Sharma, Khan, Selzner) and Toronto General Hospital (Selzner).**

Background: Patients undergoing liver transplantation are at increased risk of developing incisional hernia, which can seriously affect their postoperative course and quality of life. This retrospective study identified pre- and postoperative risk factors for incisional hernia development following liver transplantation. **Methods:** We conducted a retrospective case–control

study on 202 patients undergoing liver transplantation between 2007 and 2019. We compared 101 selected patients who underwent liver transplantation followed by incisional hernia occurrence with 101 age- and date-matched controls who did not form a hernia post-transplant. Incisional hernias were repaired open with sublay or retrorectus mesh or by primary closure. Age, sex, body mass index (BMI), transplant indication, preoperative MELD score, post-transplant complications and immunosuppressive medications were compared between the 2 groups. Hernia repair outcomes including surgical site infections (SSIs), other wound complications, length of hospital stay, and hernia recurrence were analyzed. **Results:** Patient characteristics between the 2 groups were well matched. The average time from liver transplantation to incisional hernia occurrence was 20 months. Significant risk factors for incisional hernia occurrence were transplant incision type, specifically midline incisions (0 v. 20 patients, $p = 0.01$). There was a trend toward hernia occurrence with post-transplant take-back laparotomy (12 v. 22 patients, $p = 0.06$). When analyzing factors associated with recurrence after hernia repair, interestingly viral hepatitis had a significantly lower rate of hernia recurrence ($p = 0.03$). Furthermore, hernia recurrence was impacted by a higher pre-transplant MELD score (score of 16 v. 22, $p = 0.05$), takeback laparotomy post-transplant (17% v. 40%, $p = 0.03$), retrorectus mesh repair of initial hernia repair (18% v. 50%, $p = 0.01$), and post-hernia SSIs (11% v. 32%, $p = 0.02$). No differences were observed for age, sex, BMI, immunosuppressive medications, and hernia defect size. **Conclusion:** These results highlight important risk factors for hernia occurrence and recurrence post–liver transplant, including post-transplant takeback laparotomy, hernia repair technique, and SSIs. With regards to the repair technique, intraperitoneal sublay mesh reduces hernia recurrence and is a safe option for incisional hernia repair in this complex patient population.

CANADIAN ASSOCIATION OF BARIATRIC PHYSICIANS AND SURGEONS

01

Impact of the COVID-19 pandemic on bariatric surgery in North America: a retrospective analysis of 834 647 patients. ***Kevin Verhoeff, Valentin Mocanu, Jerry Dang, Hillary Wilson, Noah Switzer, Daniel Birch, Shahzeer Karmali.*** **From the University of Alberta.**

Background: COVID-19 has transformed surgical care, yet little is known regarding implications for bariatric surgery. We sought to characterize the impact of COVID-19 on bariatric surgery delivery and outcomes. **Methods:** The Metabolic and Bariatric Accreditation and Quality Improvement Program (MBSAQIP) collects data from 885 centres in North America. The MBSAQIP database was evaluated with 2 cohorts described: the COVID-19 and the pre-COVID-19, receiving surgery in 2020 and 2015–2019, respectively. Yearly operative trends were characterized, and bivariate analysis compared demographics and postoperative outcomes. Multivariable modelling evaluated 3-day readmission, reintervention, reoperation, and factors associated with undergoing Roux-en-Y gastric bypass (RYGB). **Results:** We evaluated 834 647 patients, with 155 830 undergoing bariatric surgery during the 2020 pandemic year. A 12.1% reduction in total cases (177 208 in 2019 v. 155 830 in 2020, $p < 0.001$) and 13.8% reduction in cases per centre occurred (204.2 cases/centre in 2019 v. 176.1 cases/centre in 2020, $p < 0.001$). Patients receiving bariatric surgery during the pandemic were younger and had fewer comorbidities. Use of sleeve gastrectomy increased (74.5% v. 72.5%, $p < 0.001$), and surgery during COVID-19 was associated with reduced RYGB procedural selection (odds ratio 0.83, 95% confidence interval 0.82–0.84, $p < 0.001$). Length of stay decreased significantly (1.4 ± 1.4 d v. 1.6 ± 1.4 d, $p < 0.001$), yet postoperative outcomes were similar. After adjusting for comorbidities, patients during COVID-19 had decreased 30-day odds of readmission and reintervention, with a small increased odds of reoperation. **Conclusion:** The COVID-19 pandemic dramatically changed the landscape of bariatric surgery delivery. Further studies evaluating the long-term effects of these changes are warranted.

02

Patient selection and 30-day outcomes of SADI-S compared to RYGB: a retrospective cohort study of 47 375 patients. ***Kevin Verhoeff, Valentin Mocanu, Uzair Jogiat, Hayley Forbes, Noah Switzer, Daniel Birch, Shahzeer Karmali.*** **From the University of Alberta.**

Background: Single anastomosis duodeno-ileal bypass with sleeve gastrectomy (SADI-S) offers a novel bariatric procedure with few comparative studies evaluating patient selection or perioperative outcomes. We aimed to compare SADI-S to Roux-en-Y gastric bypass (RYGB). **Methods:** The 2020 Metabolic and Bariatric Accreditation and Quality Improvement Program (MBSAQIP) registry was analyzed, comparing SADI-S to RYGB. Bivariate analysis was performed to determine between-group differences. Multivariable logistic regression determined factors associated with serious complications or mortality. **Results:** We evaluated 47 375 patients, with 501 (1.1%) receiving SADI-S. Patients undergoing SADI-S had higher body mass index (SADI-S 51.4 ± 9.7 kg/m^2 v. RYGB 44.6 ± 7.9 kg/m^2, $p < 0.001$), and more metabolic comorbidities, including non-insulin-dependent diabetes (21.7% v. 19.0%, $p = 0.011$), insulin-dependent diabetes (12.0% v. 8.6%, $p = 0.011$) and hypertension (54.9% v. 47.6%, $p < 0.001$). Patients undergoing SADI-S experienced an increased number of anastomotic leaks (2.2% v. 0.5%, $p < 0.001$), reoperations (5.0% v. 2.6%, $p < 0.001$), pneumonias (1.6% v. 0.5%, $p < 0.001$), had sepsis more frequently (1.4% v. 0.3%, $p < 0.001$), and required more unplanned reintubations (1.2% v. 0.3%, $p = 0.004$) than those undergoing RYGB. SADI-S was independently associated with serious complications (odds ratio [OR] 1.45, 95% confidence interval [CI] 1.09–1.95, $p < 0.001$) and trended toward significance as a predictor of mortality (OR 3.29, $p = 0.060$). **Conclusion:** In comparison to RYGB, patients undergoing SADI-S were found to have more metabolic comorbidities. Compared with RYGB, SADI-S has worse perioperative outcomes and is independently associated with serious complications. Prospective studies analyzing the risk–benefit ratio and long-term comparative outcomes following SADI-S are needed.

03

New persistent opioid use following bariatric surgery: a systematic review and pooled proportion meta-analysis. ***Khadija Nasser*, *Kevin Verhoeff*, *Valentin Mocanu*, *Janice Kung*, *Kieran Purich*, *Noah Switzer*, *Daniel Birch*, *Shahzeer Karmali*. From the University of Alberta.**

Background: Increasing evidence suggests surgical patients are at risk for developing new, persistent opioid use (NPOU) following surgery. This risk may be heightened for patients undergoing bariatric surgery. Few studies have evaluated this important long-term outcome, and little is known about the rate of NPOU, or factors associated with NPOU for bariatric surgery patients. **Methods:** We conducted a systematic review of MEDLINE, Embase, Scopus, Web of Science and Cochrane databases in August 2021. Studies were reviewed and data extracted independently by 2 reviewers following Meta-analysis of Observational Studies in Epidemiology guidelines. Studies evaluating bariatric surgery patients reporting NPOU, defined as new opioid use > 90 days after surgery, were included. Backgrounds, non-English, animal and pediatric studies as well as studies with samples of $n < 5$ were excluded. Primary outcome was NPOU prevalence; secondary outcomes were patient and surgical factors associated with NPOU. Factors associated with NPOU are reported from findings of individual studies; meta-analysis could not be completed owing to heterogeneity of reporting. We retrieved a total of 2113 studies with 8 meeting inclusion criteria. In studies reporting NPOU rates ($n = 4$ studies), pooled prevalence was 6.0% (95% confidence interval 4.0%–7.0%). Patient characteristics reported by studies to be associated with NPOU included prior substance use (tobacco, alcohol, other prescription analgesics), preoperative mental health disorder (anxiety, mood disorders, eating disorders), and public health insurance. Surgical factors associated with NPOU included severe postoperative complications and in-hospital opioid use (peri- or postoperatively). No difference was consistently reported for type of surgery (Roux-en-Y gastric bypass or sleeve gastrectomy). **Conclusion:** NPOU is an uncommon but important complication following bariatric surgery, with patient factors including prior substance abuse, mental health disorders, and use of public health insurance placing patients at increased risk, and surgical factors being complications and perioperative opioid use. Studies evaluating techniques to reduce NPOU in these high-risk populations are needed.

04

Bariatric surgery should be offered to active-duty military personnel: a retrospective study of the Canadian Armed Forces experience. ***Olivier Mailloux*, *Nicolas Tassé*, *André Tchernof*, *Mélanie Nadeau*, *Philip Dawe*, *Andrew Beckett*, *Laurent Biertho*. From Université Laval (Mailloux, Tassé), Institut de cardiologie et pneumologie de Québec (Tchernof, Nadeau, Biertho) and Canadian Armed Forces (Dawe, Beckett).**

Background: Bariatric surgery is an effective, durable, and accepted treatment for obesity in civilian practice. However, it is not yet accepted for soldiers still in active duty in most countries worldwide. The Canadian Armed Forces (CAF) has approved bariatric surgery in its Spectrum of Care since 2005. **Methods:** We retrospectively reviewed perioperative data and long-term bariatric and military outcomes of 108 CAF active-duty military personnel who underwent bariatric surgery in Canada during a 61-month period. Our objectives were to assess weight loss and resolution of obesity-related comorbidities and to assess the impact of surgery on military career. Data were obtained through medical records and insurance registry review. **Results:** The cohort was predominantly male (66.7%) with a mean age of 42 ± 4.8 years and mean preoperative body mass index (BMI) of 43.6 ± 5.8 kg/m^2. Roux-en-Y gastric bypass was performed on 59 patients, sleeve gastrectomy on 29 and gastric banding on 20. All surgeries were performed laparoscopically. There were no deaths. Early and late major complications occurred in 6.5% and 9.2% of patients, respectively. Total body weight loss at last follow-up visit was 22.5 kg ± 11.0%. There was resolution or improvement of diabetes in 76.7% of patients, hypertension in 73.4%, dyslipidemia in 55.2%, gastresophageal reflux disorder (GERD) in 43.6%, and sleep apnea in 41.2%. One patient (0.9%) was medically released from the CAF because of postoperative complications of an anastomotic leak. Fifteen patients (13.9%) were deployed postoperatively. Combined deployable and possibly deployable status went from 35.4% before surgery to 47.9% postoperatively. To our knowledge, this is the largest series of bariatric surgery performed in active-duty military personnel. Bariatric surgery is effective, safe, improves deployability and does not impair military careers. **Conclusion:** These results are highly relevant to military administrations of most industrialized countries. Bariatric surgery should be offered to all active-duty military personnel who meet surgical criteria for the treatment of their obesity.

05

Opioid prescribing practices and use following bariatric surgery: a systematic review and pooled summary of data. ***Kieran Purich*, *Andrea Lin*, *Kevin Verhoeff*, *Valentin Mocanu*, *Janice Y. Kung*, *Daniel W. Birch*, *Shahzeer Karmali*, *Noah J. Switzer*. From the University of Alberta.**

Background: Bariatric surgery patients are at an increased risk of new persistent opioid use (NPOU) following surgery, with perioperative opioid use increasing their risk. In addition, many patients who have had restrictive and/or malabsorptive procedures also have altered opioid absorption, potentially putting them at increased risk for opioid overdose. Characterizing current opioid prescribing practices in these patients will guide development of post–bariatric surgery prescription guidelines in hopes of reducing NPOU. **Methods:** We performed a systematic review of Ovid MEDLINE, Ovid Embase, Scopus, Web of Science Core Collection, and Cochrane Library (via Wiley) on Aug. 20, 2021. Two authors reviewed and extracted data independently. All studies evaluating adult patients undergoing bariatric surgery that reported opioid prescriptions at discharge were included. Backgrounds, non-English studies, and studies with an $n < 5$ were excluded. Primary outcomes assessed the amount of morphine milligram equivalents (MMEs) prescribed at discharge. Secondary outcomes

evaluated opioids used following discharge, proportion of patients with unused opioids, and whether unused opioids were properly discarded. **Results:** We evaluated 2113 studies, with 18 undergoing full-text review, and 5 meeting inclusion criteria. Overall, 847 patients were included, with 450 (53%) undergoing sleeve gastrectomy and 393 (46%) receiving Roux-en-Y gastric bypass. Most patients were female (n = 484 of 589, 82.2%), and the average age and body mass index were 44.6 (± 11.8) years and 48.1 kg/m^2 (± 8.4), respectively. On average, 348.4 MMEs were prescribed to patients undergoing bariatric surgery. Patients used only 84.7 MMEs, with 87.0% (95% confidence interval 66.0%–99.0%) having unused opioid, and 34.2% retaining these excess opioids. Patients undergoing bariatric surgery are prescribed excessive opioids at discharge. **Conclusion:** When taking into consideration that 250 000 bariatric surgeries are performed in the United States annually, these opioid-prescribing practices pose a public health risk in addition to patient-specific risks. Future studies characterizing optimized post–bariatric surgery prescriptions are needed.

06

Sacred sharing circles: urban Indigenous Manitobans' experiences with bariatric surgery. ***Marta Whyte*, *Melinda Fowler-Woods*, *Amanda Fowler-Woods*, *Geraldine Shingoose*, *Andrew Hatala*, *Felicia Daeninck*, *Ashley Vergis*, *Krista Hardy*, *Kathleen Clouston*. From the University of Manitoba.**

Background: Obesity and type 2 diabetes mellitus (T2DM) are growing global health concerns disproportionately affecting Indigenous Peoples in many countries. Bariatric surgery offers superior weight loss and comorbidity resolution compared with medical management. The literature describing the experiences of Indigenous Peoples undergoing bariatric surgery is sparse. The objective of this study was to employ a decolonizing methodology to explore the experiences of urban Indigenous Peoples undergoing bariatric surgery. **Methods:** Study conception and design was guided by an Indigenous Advisory Committee (IAC), which included a community Elder. Urban Indigenous Manitobans with obesity and T2DM were recruited to participate in 2 sacred sharing circles and individual interviews. Audio transcripts were analyzed for themes using inductive thematic analysis. **Results:** Sacred sharing circles were led by an Elder with 4 participants and the IAC. Themes generated included experiencing hardship/challenges, reflecting on the importance of supports, understanding relationships with food, and healing/recovering. The participants described an overall supportive and positive experience with the bariatric pathway. Participants expressed interest in more culturally diverse supports in the clinic itself, as well as Indigenous peer mentorship. **Conclusion:** Indigenous Peoples have strong motivators for pursuing bariatric surgery and we found an overall positive experience with the bariatric pathway. Suggestions for improvement of the clinic pathway included culturally relevant supports and Indigenous peer mentorship. This study is the first to qualitatively explore the bariatric experience of Indigenous Peoples in Canada. Further research will continue to explore the health care encounter in detail and will provide the opportunity for development of culturally relevant materials and interventions.

07

Gastrogastric hernia after laparoscopic gastric great curve plication: a video presentation. ***Ting Li*, *Estifanos Debru*. From the University of Calgary.**

Background: Laparoscopic gastric greater curve plication is a bariatric procedure not commonly performed in Canada or the United States. Encounters with patients having this surgery are usually a result of medical tourism. This procedure imbricates the greater curve of the stomach upon itself using sutures, producing weight loss via restriction. There is no standardized technique and many variations in technical details have been reported. Plication failure is a known complication and can lead to gastrogastric herniation in which a portion of the stomach protrudes through a failed plication suture line. **Methods:** We present the case of a 46-year-old male who developed a gastrogastric hernia after partial failure of a laparoscopic gastric plication 4 years prior in Mexico. He initially presented with symptoms of reflux and then developed an acute gastric outlet obstruction that required urgent laparoscopy. A proximal failure of his gastric plication had led to protrusion and dilation of the gastric fundus through the failed plication suture line. The proximal stomach was obstructed due to constriction by the distal intact portion of the plication. **Results:** He was treated with laparoscopic release of the entire plication, resulting in complete symptom relief. Despite early postoperative evidence of impaired gastric emptying, he made a full recovery at 6 weeks postoperatively. **Conclusion:** While gastric plication is not a bariatric procedure performed in Canada, it is important that Canadian surgeons be aware of the possible complications related to it, as medical tourism for bariatric surgery will continue to occur. An approach to management of these patients, particularly those with acute symptoms, is a necessary part of Canadian bariatric surgical practice.

08

Characterization of comorbidities predictive of bariatric surgery. ***Mirza Shaharyar Ahmad*, *Warren Sun*, *Jerry Dang*, *Noah Switzer*, *Daniel Birch*, *Shahzeer Karmali*, *Christopher De Gara*. From University of Alberta.**

Background: The obesity epidemic continues to rise, with only 1% of eligible patients undergoing bariatric surgery annually. Patients enrolled in bariatric centres of excellence participate in extensive multidisciplinary preoperative counselling to select appropriate surgical candidates, contributing to surgical wait times. We aimed to characterize commonalities between patients who were successful at obtaining bariatric surgery to understand the major factors that make one an ideal candidate. **Methods:** A retrospective chart review of all patients enrolled at a single, publicly funded bariatric centre of excellence in 2015 was performed. Patient demographics, comorbidities, and surgical data were extracted and correlated with surgery using the χ^2 test. Binary logistic regression analysis was used to develop a statistical model to predict the likelihood of surgical eligibility. **Results:** In 2015, 666 new patients were enrolled in the bariatric clinic, of whom 208 underwent bariatric surgery. The χ^2 analysis ($p < 0.05$) of the individual comorbidities

revealed that alcohol abuse (χ^2_1 = 4.34, odds ratio [OR] 0.00), anxiety (χ^2_1 = 4.53, OR 0.60), gastresophageal reflux disease (χ^2_1 = 10.16, OR 0.54), hypothyroidism (χ^2_1 = 5.37, OR 1.59), liver disease (χ^2_1 = 24.15, OR 0.20), osteoarthritis (χ^2_1 = 7.49, OR 0.59), mental health comorbidities (χ^2_1 = 8.95), and other medical comorbidities (chronic pain, cardiovascular disease, and incontinence) (χ^2_1 = 13.39) were the most predictive factors for determining eligibility. The logistic regression developed successfully explained 25% of the variance in patients treated with surgery and correctly classified 74.4% of the analyzed cases. Female sex (OR 2.20), hypertension (OR 1.71), and dyslipidemia (OR 2.09) were associated with an increased likelihood of bariatric surgery, whereas patients with gastresophageal reflux disease (OR 0.62), liver disease (OR 0.25), osteoarthritis (OR 0.52), mental health comorbidities (OR 0.39), medical comorbidities (chronic pain, cardiovascular disease, and incontinence) (OR 0.56), and increasing number of antihypertensive medications (OR 0.62) were less likely to be considered. **Conclusion:** The use of patient metrics may help predict surgical candidacy and have a role in triaging for obesity management, thereby reducing surgical wait times.

09

Efficacy of preoperative high-dose liraglutide in patients with superobesity. ***Warren Sun, Jennifer Halasz, Jerry Dang, Noah Switzer, Aliyah Kanji, Daniel Birch, Renuca Modi, Shahzeer Karmali.*** **From the University of Alberta.**

Background: We aimed to study the efficacy of liraglutide as a preoperative adjunct in patients with superobesity undergoing bariatric surgery. **Methods:** A retrospective, single-centre cohort study was performed. All adult patients with a body mass index (BMI) ≥ 50 kg/m^2 without diabetes or previous bariatric surgery enrolled between July 1, 2014, and June 30, 2017, were included. Outcomes of interest included rate of successful laparoscopic Roux-en-Y gastric bypass (LRYGB), amount of preoperative Optifast diet required, amount of preoperative and postoperative weight loss, and postoperative complications. **Results:** A total of 2369 charts were reviewed, with 412 patients meeting inclusion criteria. The average age was 41.8 ± 11.0 years and 292 (70.9%) were female. Forty-nine patients (11.9%) had surgery with preoperative liraglutide, 63 (15.5%) had surgery only, 51 (12.4%) had liraglutide only, and 190 (46.1%) had neither. The average duration of preoperative liraglutide treatment was 8.9 ± 5.7 months. Patients who had preoperative liraglutide lost an average of 8.5 ± 5.0 kg/m^2 v. 6.3 ± 4.8 kg/m^2 in patients without (p < 0.05). Preoperative Optifast was used in 21 (42.9%) patients with preoperative liraglutide v. 22 (34.9%) patients with surgery only (odds ratio [OR] 1.40, 95% confidence interval [CI] 0.65–3.04, p = 0.44). The average length of Optifast was 13.2 ± 10.5 weeks v. 11.8 ± 9.1 weeks (p = 0.63). LRYGB was the surgery performed in 36 (73.5%) patients with liraglutide v. 44 (69.8%) patients without liraglutide. However, 1 (2.7%) patient in the liraglutide group was unable to undergo LRYGB because of technical limitations v. 3 (6.4%) in the surgery only group (OR 2.46, 95% CI 0.35–32.66, p = 0.63). Both groups had 4 (8.2% v. 6.3%) patients with complications at 30 days (OR 1.31, 95% CI 0.36–4.69, p = 0.73), but the liraglutide group only had 1 (2.0%) additional complication at 1 year v. 4 (6.3%) in the surgery only group (OR 0.31, 95% CI 0.02–1.98, p = 0.38). **Conclusion:** Although patients with superobesity undergoing bariatric surgery treated with liraglutide lost more weight preoperatively, it was not associated with increased technical feasibility of LRYGB, reduction of preoperative Optifast use, or reduction of postoperative complications.

10

The effect of linear stapled gastrojejunostomy size in Roux-en-Y gastric bypass. ***Hilalion (San) Ahn, Jeffrey Gu, Amer Jarrar, Nicole Kolozsvari.*** **From The Ottawa Hospital and University of Ottawa.**

Background: The creation of the linear stapled gastrojejunostomy (GJ) is a crucial step in Roux-en-Y gastric bypass (RYGB) surgery as its associated complications carry significant morbidity and mortality. However, there remains significant variability in practice regarding the size of stapler used, with 30 mm or 45 mm staplers being most common. The objective of this study was to determine whether weight loss or complications differ with 30 mm v. 45 mm GJ size. **Methods:** This was a retrospective cohort study of consecutive patients who underwent RYGB between January 2010 and May 2020. Patient data were obtained from the Ontario Bariatric Network Registry. GJ size and bypass limb lengths were confirmed with each individual surgeon included in the study. The primary outcome was weight loss at 1 year. Secondary outcomes included weight loss beyond 1 year, stenosis and erosions. For all statistical tests, 2-tailed t tests were performed to determine significance at p < 0.05. Analysis of covariance was used for covariate adjustments. **Results:** All included patients (n = 6135) had either a 30 mm (n = 4336) or 45 mm (n = 1799) linear stapled GJ. Percent total weight loss (%TWL) at 1 year for the 30 mm and 45 mm groups was 31.02% and 32.18%, respectively (mean difference 1.16%, 95% confidence interval [CI] 0.68–1.64, p < 0.001) and at 3 years was 29.51% and 30.16%, respectively. When adjusting for baseline body mass index, waist circumference, age, gender, and total limb length, %TWL at 1 year was 30.21% and 31.27% for the 30 mm and 45 mm groups, respectively (mean difference 1.06%, 95% CI 0.23–1.89, p = 0.01). At 1 year, stenosis rates for the 30 mm and 45 mm groups were 1.13% (n = 4) and 4.35% (n = 5), respectively, and erosion rates were 32.96% (n = 117) and 32% (n = 37), respectively. **Conclusion:** Owing to the very large sample size, a statistically significant difference in %TWL was detected, favouring the 45 mm GJ. However, the differences in weight loss were not clinically meaningful. Both the 30 mm and 45 mm linear stapled GJ provide excellent sustained weight loss.

11

Fragility of statistically significant outcomes in randomized trials comparing bariatric surgeries. ***Yung Lee, Yasith Samarasinghe, Lucy Chen, Akithma Hapugall, Arshia Javidan, Tyler McKechnie, Aristithes Doumouras, Dennis Hong.*** **From McMaster University (Lee, Samarasinghe, Chen, Hapugall, McKechnie, Doumouras, Hong) and University of Toronto (Javidan).**

Background: Randomized controlled trials (RCTs) are regarded as gold standards for studying causal relationships, but the strength of their reported *p* values can be difficult to ascertain. The Fragility Index (FI) is a novel metric that evaluates the frailty of clinical trial findings. It is defined as the minimum number of patients within 1 trial arm that would be required to change their status from a nonevent to event for the findings to lose significance. This study aims to characterize the robustness of bariatric surgery RCTs by calculating their FI scores. **Methods:** A search was conducted in MEDLINE and Embase from January 2000 to February 2022 for RCTs comparing 2 bariatric surgeries with statistically significant dichotomous outcomes. Two reviewers independently completed article screening, evaluated risks of bias, and performed data extraction. A 2-tailed Fisher exact test was used to calculate *p* values. Bivariate correlation was conducted to identify associations between FI and trial characteristics. **Results:** A total of 35 RCTs were included. The median sample size was 80 patients (interquartile range [IQR] 58–109) and the median total events was 25 (IQR 10–40). The median FI was 2 (IQR 0–5), meaning that switching 2 patients in 1 treatment arm from a nonevent to event will overturn the significant result to nonsignificant. A subgroup analysis of trials assessing diabetes-related outcomes (8 trials) showed a median FI value of 4 (IQR 2–6.5). Increasing FI was found to be correlated with decreasing *p* value ($r = -0.873$, $p < 0.001$), increasing sample size ($r = 0.415$, $p = 0.013$), increasing number of total events ($r = 0.784$, $p < 0.001$), and increasing journal impact factor ($r = 0.470$, $p = 0.004$). **Conclusion:** Bariatric surgery RCTs did not prove to be robust. The statistical significance of most studies can be reversed by changing the status of only a few patients in 1 trial arm from a nonevent to event. Future research should examine the use of FI in trial designs.

12

Weight loss outcomes for patients undergoing conversion to Roux-en-Y gastric bypass after sleeve gastrectomy. ***Eileen Roach*, *Simon Laplante*, *Shannon Stogryn*, *Azusa Maeda*, *Timothy Jackson*, *Allan Okrainec*. From University of Toronto.**

Background: Despite excellent reported outcomes after laparoscopic sleeve gastrectomy (LSG), a sizable proportion of patients go on to have a secondary bariatric surgery to manage adverse effects or address weight recidivism after LSG. Reported weight loss outcomes for patients undergoing laparoscopic Roux-en-Y gastric bypass (LRYGB) after previous LSG are variable. We sought to determine the weight loss outcomes of patients undergoing LRYGB after LSG in the largest bariatric surgical network in Canada and to determine whether outcomes differ according to indications for conversion. The Bariatric Registry is a multicentre database with prospectively collected standardized data on patients undergoing bariatric surgery at 10 Bariatric Centers of Excellence comprising the Ontario Bariatric Network in Ontario, Canada. **Methods:** A retrospective analysis was performed of patients who underwent LRYGB after previous LSG between 2012 and 2019. Weight loss outcomes were compared between patients who underwent LRYGB for insufficient weight loss/weight regain and those who underwent conversion to LRYGB for other reasons. **Results:** Excluding patients with multiple revisions and those without follow-up data, 48 patients were included in the analysis: 33 patients (69%) underwent conversion to LRGYB for insufficient weight loss/weight regain (group 1) and 15 patients (31%) underwent conversion for other reasons (group 2). Mean body mass index (BMI) measured pre-LSG, pre-LRYGB, and at mid-term follow-up after LRYGB was 61, 48, and 43 kg/m^2, respectively, in group 1 and 51, 39, and 34 kg/m^2, respectively, in group 2. ΔBMI and %total weight loss (%TWL) at mid-term follow-up were not significantly different between the groups. Conversion to LRYGB after previous LSG resulted in an additional loss of 4 kg/m^2 in BMI points at mid-term follow-up. **Conclusion:** Patients lost a similar number of BMI points, and cumulative %TWL was similar regardless of reason for conversion. This can help inform surgical decision making after failed LSG.

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Are long waiting lists for bariatric surgery detrimental to patients? A single-centre experience. ***Alexandra Chow*, *Daniel Birch*, *Shahzeer Karmali*, *Aliyah Kanji*, *Noah Switzer*. From the University of Alberta.**

Background: We aimed to evaluate the impact of surgical delays due to the COVID-19 pandemic on a cohort of bariatric surgery waiting list patients at a single high-volume, accredited bariatric centre in Canada. **Methods:** We identified all patients on the waiting list who had consented to a primary bariatric operation before June 2021. A review of medical records and a structured telephone interview with each patient was conducted. Changes in weight, body mass index (BMI) and use of antiobesity medications were analyzed. Questions regarding patient experience on the waiting list were also analyzed. **Results:** Of 123 patients identified on the bariatric surgery waiting list, 97 (78.9%) participated in the survey and were enrolled in this study. Most patients were female (74.2%), with a mean age of 45.2 ± 10.6 years. The length of time on the waiting list was 8–33 months (mean 13.3 ± 4.8 months). The proportion of patients on antiobesity medications increased from 59.8% to 72.2%, although this was not statistically significant ($p > 0.05$). There was a small but statistically significant decrease in weight (140.0 ± 35.6 kg v. 135.5 ± 35.5 kg, $p < 0.0001$) and BMI (49.3 ± 9.9 kg/m^2 v. 47.7 ± 10.2 kg/m^2, $p < 0.0001$). However, there was no significant change in weight and BMI in the subgroup of patients who were not on antiobesity medications. In terms of patient experience, 39.2% of patients felt that they were negatively impacted by the length of time on the waiting list, and 16.5% were willing to travel out of province for their bariatric surgery. **Conclusion:** Patients on the bariatric surgery waiting list remained weight stable despite delays secondary to the COVID-19 pandemic. However, extended waiting times for bariatric surgery have had a negative impact on patient satisfaction.

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Does upper gastrointestinal swallow study after bariatric surgery lead to earlier detection of leak? ***Jessica Trac*, *Michael Balas*, *Denise Gee*, *Matthew Hutter*, *Ozanan Meireles*, *James Jung*. From University of Toronto (Trac, Balas, Jung) and Harvard University (Gee, Hutter, Meireles).**

Background: Our study aimed to determine if there was an association between conducting swallow study (SS) after elective bariatric surgery and earlier diagnosis of gastrointestinal leak. **Methods:** We performed an observational cohort study of adults who underwent laparoscopic primary Roux-en-Y gastric bypass (RYGB) (n = 82 510) and sleeve gastrectomy (SG) (n = 283 520) using the 2015–2019 Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program database. Propensity scores were used to match cohorts of RYGB and SG patients who underwent routine SS (RSS) v. no SS (NSS), selective SS (SSS) v. NSS, and RSS v. SSS across covariates. Primary outcome was time to diagnosis of gastrointestinal leak. After matching, the median days to detection of leak were compared, and Nelson–Aalen curve function was used to estimate the cumulative hazards of diagnosing leak. **Results:** During the study period, 135 335 (32%) SG and 36 280 (22%) RYGB patients received RSS and about 1% of patients received SSS. After matching, patients who received RSS did not have a shorter time to diagnosis of leak than those who received NSS (RYGB RSS median 7 [interquartile range (IQR) 3–12] d v. NSS 6 [IQR 3–12] d, p = 0.8; SG RSS median 15 [IQR 9–22] d v. NSS 14 [IQR 7–21] d, p = 0.2) and was not associated with lower cumulative risk of leak (RYGB hazard ratio [HR] 1.0, 95% confidence interval [CI] 0.8–1.3; SG HR 0.9, 95% CI 0.8–1.1). RYGB patients who received SSS had a higher risk of leak than those who received RSS (HR 2.2, 95% CI 1.0–4.9) and a trend toward shorter time to diagnosis (SSS 3 [IQR 1–11] d v. RSS 5 [IQR 2–10] d, p = 0.06). **Conclusion:** RSS after RYGB or SG was not associated with earlier diagnosis of leak or lower cumulative risk of leak compared with NSS. Surgeons seem to practise sound judgment on which patients should undergo SSS.

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Pharmaceutical utilization before and after bariatric surgery. *Wenjing He*, *Ashley Vergis*, *Krista Hardy*. From the University of Manitoba.

Background: Bariatric surgery is the most effective treatment for obesity, resulting in significant weight loss and comorbidity resolution. Bariatric programs often determine comorbidity resolution by patient-reported medication discontinuation. Administrative data provide an opportunity to accurately assess changes in pharmaceutical utilization based on changes in prescriptions. We sought to evaluate trends in pharmaceutical utilization among the bariatric surgery population of Manitoba. **Methods:** Centre for Metabolic and Bariatric Surgery (CMBS) patients who underwent gastric bypass or sleeve gastrectomy between 2012 and 2017 with 5-year pre- and postoperative follow-up data were included. Patients identified in the CMBS database were anonymously linked to the administrative data at the Manitoba Centre for Health Policy (MCHP) using scrambled Personal Health Identification Numbers (PHINs). The top prescriptions 5 years pre- and postoperatively were reported by total counts. **Results:** Selective serotonin reuptake inhibitors and other antidepressant medications remained stable following bariatric surgery. There was a significant increase in prescriptions for proton pump inhibitors (PPIs) and opioids. Overall, biguanides, sulfonylureas and insulin prescribing for diabetes management were significantly reduced. Dispensing of β-hydroxy β-methylglutaryl-coenzyme A (HMG-CoA) reductase inhibitors for hypercholesterolemia, angiotensin-converting enzyme inhibitors, calcium-channel blockers, angiotensin receptor blockers, thiazides and β-blockers for hypertension also decreased. **Conclusion:** This study explored trends in pharmaceutical utilization before and after bariatric surgery. The top prescribed medications shifted from antidepressants to PPIs post-surgery. Bariatric surgery decreased the use of medications for diabetes, hypertension and hypercholesterolemia. The increase in postoperative PPIs is consistent with the practice of routinely administering PPIs for 6 months postoperatively. Additionally, the increase in opioid prescriptions might relate to postoperative pain management. Further analysis is required to compare the shift in prescription type and frequency in closer relation to the perioperative period v. longer-term postoperatively, especially for opioid and PPI prescriptions.

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Same-day discharge Roux-en-Y gastric bypass at a Canadian bariatric centre: pathway implementation and early experiences. *Karim Ramji*, *Vanessa Boudreau*, *Dennis Hong*, *Mehran Anvari*, *Pouya Iranmanesh*, *Karen Barlow*, *Tyler Cookson*, *Rafik Bolis*, *Harsha Shanthanna*, *Jonah Shiroky*. From St. Joseph's Healthcare Hamilton (Ramji, Boudreau, Hong, Anvari, Barlow, Cookson, Bolis, Shanthanna, Shiroky), McMaster University (Ramji, Boudreau, Hong, Anvari, Bolis, Shanthanna), and Hôpitaux Universitaires de Genève (Iranmanesh).

Background: Bariatric surgery is widely accepted as an effective tool in the management of obesity. Early discharge protocols have been applied in bariatric surgery to standardize postoperative care, minimize inpatient resources, increase patient turnover, and maximize program capacities. Same-day discharge (SDD) is the natural evolution of a successful early patient discharge initiative. Many bariatric centres across North America have adopted SDD for sleeve gastrectomy and some have now demonstrated the safety and feasibility of SDD for patients undergoing Roux-en-Y gastric bypass (RYGB). **Methods:** We illustrated the feasibility and implementation of SDD for RYGB at a high-volume bariatric centre in Canada. **Results:** Thirty-six patients were scheduled for SDD in our program, with 20 patients meeting our SDD criteria while 16 patients were discharged after an overnight stay or later. No statistically significant difference in operative time or blood loss existed between the 2 groups. Patients who qualified for SDD received more sugammadex (30% v. 0%, p = 0.018), required less surgical ward doses of hydromorphone (0.47 v. 1.16 mg, p = 0.022) and ondansetron (4.2 v. 7.5 mg, p < 0.001) and received less ward intravenous fluids (mean 603 mL v. 1044 mL, p < 0.001). There were no 30-day complications. One 30-day emergency department (ED) visit occurred in the SDD group, and 1 ED visit and 1 overnight admission occurred in the postoperative day ≥ 1 group. All investigations and imaging were normal. Patients who did not qualify for SDD experienced residual postoperative pain, urinary retention, and apprehension about discharge. **Conclusion:** Further data are required to determine clinical safety. We continue to evolve our SDD pathway.

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Safety and efficiency of performing primary bariatric surgery at an ambulatory site of a tertiary care hospital: a 5-year experience. ***Ekaterina Kouzmina*, *Shaidah Deghan*, *Boris Zevin*. From Queen's University (Kouzmina, Zevin) and University of Toronto (Deghan).**

Background: Obesity is a chronic disease with limited access to surgical treatment across Canada. We previously reported that primary bariatric surgery can be safely performed at an ambulatory site of a tertiary care hospital. The objective of this study was to examine the evolution of our program over the first 5 years and to explore whether surgery at an ambulatory site is more efficient than at a tertiary care hospital. **Methods:** We performed a retrospective cohort study of consecutive patients over the age of 18 years who underwent primary laparoscopic Roux-en-Y gastric bypass (LRYGB) and sleeve gastrectomy (LSG) between September 2016 and August 2021 at our ambulatory and tertiary-care hospital sites. We compared operating room turnover times, operative times, length of stay and complication rates. The Student *t* test was used to analyze continuous variables, while the Wilcoxon signed-rank test and proportion testing were used for discrete values. **Results:** A total of 805 patients (762 LRYGB, 43 LSG) had surgery at our ambulatory site, and 109 (92 LRYGB, 17 LSG) at the tertiary care site. The mean operative time for LRYGB at the ambulatory site was 134.8 ± 35.5 min v. 178.0 ± 51.4 min at the tertiary care site, whereas for LSG it was 108.1 ± 27.1 min and 147.1 ± 34.3 min, respectively. Turnover times at the ambulatory site were significantly faster (19.4 ± 5.3 min v. 28.1 ± 6.1 min, $p < 0.01$), as were the post-anesthesia care unit times (2.4 ± 0.6 h v. 3.1 ± 1.5 h, $p < 0.01$). Complication rates at 30 days after surgery ranged between 5.5% and 11% per year. The proportion of patients requiring transfer from the ambulatory site to the tertiary care site for a complication remained constant over time (1.5%–6.2% per year, $p = 0.14$). **Conclusion:** Primary LRYGB and LSG can be safely performed at an ambulatory site of a tertiary hospital with the added advantage of improved operating room efficiency. Transfers to a tertiary care hospital did not decrease over the 5-year evolution of the program.

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Impact of psychiatric diagnosis on weight loss outcomes 3 years after bariatric surgery. ***Cypriana Koziak*, *Zacharie Cloutier*, *Tyler Cookson*, *Karen Barlow*, *Vanessa Boudreau*, *Mehran Anvari*. From McMaster University.**

Background: Psychiatric illnesses are common comorbidities in the bariatric population. The objective of this study was to compare the impact of a psychiatric diagnosis on weight loss outcomes up to 3 years postoperatively in patients undergoing bariatric surgery. **Methods:** A retrospective cohort study was performed using data from the Ontario Bariatric Registry, which included patients between 18 and 65 years old, with a body mass index (BMI) < 50, and undergoing either a vertical sleeve gastrectomy (VSG) or Roux-en-Y gastric bypass (RYGB) since 2010. Weight loss outcomes were compared between patients with and without a documented psychiatric illness. **Results:** A total of 17 022 patients were identified. Of these, 15 152 patients underwent RYGB, and 1870 underwent VSG, with 52.2% and 55.4% having a documented psychiatric illness, respectively. At a 3-year follow-up, in the RYGB group, mean %excess weight loss (%EWL) was 72.7% in the psychiatric illness group and 71.7% in the nonpsychiatric illness group ($p = 0.250$, 95% confidence interval [CI] –0.732 to 2.732). In the VSG group, at 3 years, %EWL was 53.6% in the psychiatric illness group and 56.9% in the nonpsychiatric illness group ($p = 0.314$, 95% CI –3.136 to 9.736). No statistically significant difference in %EWL was found between patients with and without a psychiatric diagnosis in both RYGB and VSG groups. **Conclusion:** A psychiatric diagnosis is not a predictor of worse outcomes for patients up to 3 years post-RYGB or VSG. Given similar weight loss between the groups, a psychiatric diagnosis should not be used to discriminate against or exclude bariatric patients from receiving bariatric surgery.

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Ursodeoxycholic acid (UDCA) for prevention of gallstone disease after laparoscopic sleeve gastrectomy (LSG): an Atlantic Canada perspective. ***Intekhab Hossain*, *Jane Brodie*, *Erin O'Brien*, *Katherine Tedman-Aucoin*, *Diana Lawlor*, *Raleen Murphy*, *Laurie Twells*, *David Pace*, *James Ellsmere*, *Bradley Evans*. From Memorial University of Newfoundland (Hossain, Brodie, O'Brien, Murphy, Twells, Pace, Evans) and Dalhousie University (Tedman-Aucoin, Lawlor, Ellsmere).**

Background: Obesity and rapid weight loss are established risk factors for gallstone formation. Research has shown prophylactic ursodeoxycholic acid (UDCA) may be beneficial in reducing gallstone disease after bariatric surgery. Most studies to date included patients undergoing Roux-en-Y gastric bypass (RYGB), while literature for laparoscopic sleeve gastrerctomy (LSG) is challenged by low patient numbers, attrition, and inconsistent clinical end points for gallstone disease. Effects of UDCA post-LSG at 1 site in Atlantic Canada was previously assessed and showed significant decrease in cholecystectomy rates. The control group was very small as almost all patients were given UDCA, and the current study intended to expand the comparison by adding data from a second site. **Methods:** We performed a retrospective chart review of patients who underwent LSG between 2007 and 2019 at 2 tertiary hospitals in different health authorities. At 1 site UDCA is routinely prescribed post-LSG for 6 months, while in the other, UDCA is not given. Both sites perform LSG as the most frequent primary bariatric operation. Patients who underwent cholecystectomy before LSG or were lost to follow-up were excluded. Primary and secondary outcomes were cholecystectomy and endoscopic retrograde cholangiopancreatography (ERCP) rates, respectively. **Results:** A total of 751 patients underwent LSG at the 2 study sites during the study period. After exclusion criteria were applied, 461 patients were included in the study: 303 in the UDCA group and 158 in the control group. Cholecystectomy rate was not significantly associated with

UDCA administration; however, there was a trend toward less cholecystectomy in the UDCA group (8.3% v. 13.9%, p = 0.056). The ERCP rate was significantly lower with UDCA use (0.3% v. 2.5%, p = 0.031). **Conclusion:** Our findings support the 2019 American Society for Metabolic and Bariatric Surgery guidelines for administering prophylactic UDCA after LSG for preventing gallstone disease.

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Fecal microbial transplantation and fibre supplementation in patients with severe obesity and metabolic syndrome: a randomized double-blind, placebo-controlled phase 2 trial. ***Valentin Mocanu*, *Terry Zhang*, *Edward Deehan*, *Dina Kao*, *Naomi Hotte*, *Daniel Birch*, *Shahzeer Karmali*, *Kalutota Samarasinghe*, *Jens Walter*, *Karen Madsen*. From University of Alberta (Mocanu, Zhang, Deehan, Kao, Hotte, Birch, Karmali, Samarasinghe, Madsen) and APC Microbiome Institute, Cork University (Walter).**

Background: Fecal microbial transplantation (FMT) from lean donors to obese patients with metabolic syndrome has been associated with promising yet short-term metabolic improvements. The concept of using dietary or fibre supplementation to enhance effects induced by FMT has been much discussed in the literature, but to date no human trials have examined this concept. In this study, we tested the application of daily fibre supplementation as an adjunct to FMT therapy to modulate cardiometabolic outcomes. **Methods:** We performed a 12-week 1:1:1:1 double-blind randomized trial in patients with severe obesity and metabolic syndrome receiving oral FMT to test the efficacy and safety of high-fermentable (HF) and low-fermentable (LF) fibre supplements (NCT03477916). The primary outcome was the assessment of change in insulin sensitivity from baseline to 6 weeks using the homeostatic model assessment (HOMA2-IR/IS). **Results:** Seventy participants were randomized to the FMT-HF (n = 17), FMT-LF (n = 17), HF (n = 17) and LF (n = 19) groups. Participants completing our primary end point had a mean age of 47.8 ± 10.0 years, a mean body mass index of 45.3 ± 7.0 kg/m^2, and a female sex predominance (83.6%). After 6 weeks, only patients in the FMT-LF group had significant improvements in HOMA2-IR (3.16 ± 3.01 at 6 weeks v. 3.77 ± 3.57 at baseline, p = 0.02). These benefits were associated with increased microbial richness and improvements in GLP-1 metabolism. At 6 weeks, FMT-LF was further associated with significant changes in bacterial tax, including increases in *Phascolarcobacterium*, *Christensenellaceae*, *Bacteroides*, and *Akkermansia muciniphilia*. FMT-LF was the only group demonstrating significant increases in bacterial richness as well as shifts in microbial composition more closely resembling donor ecology ($q < 0.05$). Findings occurred in the absence of changes in anthropometric parameters, dietary intake, medication regimen and were not observed in groups receiving LF fibre or in any group following fibre cessation. **Conclusion:** We provide proof of concept for the use of a single-dose oral FMT combined with daily low-fermentable fibre supplementation to improve insulin sensitivity in patients with severe obesity and metabolic syndrome.

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01

Incidence, timing and outcomes of venous thromboembolism in patients undergoing surgery for esophagogastric cancer: a population-based cohort study. ***Nader Hanna*, *Erin Williams*, *Weidong Kong*, *Adam Fundytus*, *Christopher Booth*, *Sunil Patel*, *Antonio Caycedo-Marulanda*, *Wiley Chung*, *Sulaiman Nanji*, *Shaila Merchant*. From Queen's University.**

Background: Abdominal surgery and chemotherapy are risk factors for venous thromboembolism (VTE) in patients with cancer, but their contribution in patients with esophagogastric cancer is unclear. **Methods:** We quantified VTE risk, identified risk factors for VTE, and determined the association between VTE and survival in patients undergoing surgery for esophagogastric cancer. A population-based retrospective cohort study was conducted using linked administrative databases. We used the Ontario Cancer Registry to identify patients with esophageal or gastric cancer between who underwent surgery between January 2007 and December 2016. First VTE event was captured at clinically relevant time points 180 days before and after surgery. Logistic regression was used to identify factors associated with VTE, with odds ratios (OR) and 95% confidence intervals (CIs) reported. Cox proportional hazards regression models were used to estimate associations between covariates and overall survival (OS) and cancer-specific survival (CSS). **Results:** Of the 4894 patients who had esophagectomy or gastrectomy, 8% (n = 383 of 4894) had a VTE. VTE risk was 2.5% (n = 123 of 4894) 180 days before surgery, 2.8% (n = 138 of 4894) within 30 days of surgery and 2.5% (n = 122 of 4894) from 31 to ≤ 180 days after surgery. Of the patients with VTE within 30 days of surgery, 34% (n = 47 of 138) were diagnosed after hospital discharge. Preoperative chemotherapy was associated with VTE 180 days before surgery (OR 3.84, 95% CI 2.41–6.11). Increased hospital length of stay (LOS) was associated with VTE 30 days after surgery (OR 1.08, 95% CI 1.02–1.14, per week). In adjusted models VTE was associated with inferior OS (hazard ratio [HR] 1.36, 95% CI 1.13–1.63) and CSS (HR 1.42, 95% CI 1.16–1.75). **Conclusion:** Highest VTE risk is within 30 days of surgery with one-third diagnosed after hospital discharge. Longer hospital LOS and preoperative chemotherapy are associated with increased VTE risk. VTE is an independent risk factor for inferior survival in patients with esophagogastric cancer.

04

Omission of axillary staging and survival in elderly women with early-stage breast cancer: a population-based cohort study. ***Matthew Castelo*, *Bettina Hansen*, *Lawrence Paszat*, *Nancy Baxter*, *Adena Scheer*. From the University of Toronto.**

Background: Surgical axillary staging in women aged ≥ 70 years with early-stage breast cancer is controversial. Older randomized evidence has not shown axillary staging improves survival, but recent observational studies have been mixed, and widespread de-implementation of the practice has not occurred. The aim of this study was to determine if axillary staging is associated with survival in elderly women with breast cancer. **Methods:** This was a population-based cohort study using the Surveillance, Epidemiology, and End Results registry. Women aged ≥ 70 years diagnosed with T1–T2 invasive breast cancer from 2005 to 2015 were included. Overlap propensity score weighting was used to adjust for confounders. Overall survival (OS) was determined and hazard ratios (HRs) reported with 95% confidence intervals (CIs). Breast cancer-specific survival was determined using competing risks analysis, and subdistribution hazard ratios (sdHRs) reported. Additional adjustment was performed for receipt of chemotherapy and radiotherapy. **Results:** We included 144 329 elderly women, of whom 22 621 (15.7%) did not undergo axillary staging. After overlap propensity score weighting, baseline characteristics were well balanced between the 2 groups. Women who did not undergo axillary staging were significantly less likely to receive chemotherapy (adjusted relative risk [RR] 0.58, 95% CI 0.54–0.62) or radiotherapy (adjusted RR 0.53, 95% CI 0.52–0.54), and had significantly worse OS (adjusted HR 1.22, 95% CI 1.19–1.25), and breast cancer–specific survival (adjusted sdHR 1.14, 95% CI 1.08–1.21) compared with those who had staging. Subgroup analyses restricted to women with ER+/HER2– tumours showed similar findings to the main analysis (adjusted sdHR 1.17, 95% CI 1.05–1.31). **Conclusion:** These findings suggest elderly women with early-stage breast cancer who do not undergo axillary staging experience worse outcomes. Reasons for this disparity may be multi-factorial and require further investigation.

05

Patients' experiences receiving cancer surgery during the COVID-19 pandemic: a qualitative study. ***Makena Pook*, *Tahereh Najafi Ghezeljeh*, *Maxime Lapointe-Gagner*, *Philip Nguyen-Powanda*, *Hiba Elhaj*, *Fateme Rajabiyazdi*, *Lawrence Lee*, *Liane S. Feldman*, *Julio Fiore Jr*. From McGill University (Pook, Lapointe-Gagner, Nguyen-Powanda), Iran University of Medical Sciences (Najafi Ghezeljeh), McGill University Health Centre (Elhaj, Lee, Feldman), Carleton University (Rajabiyazdi), and Research Institute of the McGill University Health Centre (Fiore).**

Background: In response to COVID-19, Quebec repurposed surgical care infrastructure and delayed many elective cancer surgeries. However, postponing cancer surgery is known to cause anxiety and distress. **Methods:** A qualitative study was conducted to understand patients' experiences receiving surgical cancer treatment during the COVID-19 pandemic. Patients who underwent general surgery for cancer at the McGill University Health Centre between March 2020 and January 2021 were invited to one-to-one interviews. Patients were purposefully selected for maximum variation using quota sampling (i.e., targeting delay status, pandemic phase, cancer site, and clinical/demographic characteristics) until interviews produced no new information (i.e., thematic saturation). Interviews were conducted using a semistructured guide, audio-recorded, transcribed verbatim, and analyzed independently by 2 researchers. Data were managed using MAXQDA2020 and analyzed according to inductive thematic analysis. **Results:** Interviews were conducted with 20 patients (mean age 64 yr; 10 males; cancer sites: 8 breast, 4 skin, 4 hepato-pancreato-biliary, 2 colorectal, and 2 gastroesophageal). Surgery was delayed for 14 patients: 8 by the hospital, 4 by the patient, and 2 owing to a positive COVID-19 test. Thematic analysis revealed that patients considered their susceptibility to infection, hospital safety measures, and burden on health care resources when determining willingness to undergo surgery. Patients weighed these risks against the urgency of their health condition and recommendations of their provider. Changes to the hospital environment (e.g., COVID-19 preventative measures) and deviations from expected treatment (e.g., alternative treatments, remote consultations, rescheduled care) caused diverse psychological responses, ranging from increased satisfaction to severe distress. Patients employed coping strategies (e.g., reframing care interruptions, communicating with clinicians, information seeking) to mitigate distress. **Conclusion:** Changes in care during the pandemic elicited diverse psychological responses from patients undergoing cancer surgery. Patient coping was facilitated by open, consistent communication with clinicians, emphasizing the importance of patient-centred discussions regarding surgical delays within and beyond the pandemic.

06

Cancer surgery outcomes are better at high-volume centres. ***Jesse Zuckerman*, *Rinku Sutradhar*, *Barbara Haas*, *Matthew Guttman*, *Antoine Eskander*, *Natalie Coburn*, *Tyler Chesney*, *Bourke Tillman*, *Victoria Zuk*, *Alyson Mahar*, *Amy Hsu*, *Wing Chan*, *Julie Hallet*. From University of Toronto (Zuckerman, Sutradhar, Haas, Guttman, Eskander, Coburn, Chesney, Tillman, Zuk, Hallet), University of Manitoba (Mahar), University of Ottawa (Hsu), and ICES (Chan).**

Background: With more older adults (OA) undergoing cancer surgery, high OA volumes may allow hospitals to develop specialized care. To understand if OA volume is a target for improving cancer care, we explored the association between hospitals' OA volume and outcomes after thoracoabdominal cancer surgery. **Methods:** We performed a retrospective cohort study of adults aged ≥ 70 years undergoing gastrointestinal (GI), genitourinary (GU), and lung cancer surgery in Ontario (2007–2019). Hospital OA volume, the annual number of resections in OA at each institution in the 2 years before index surgery, helped define the exposure, the proportion of hospitals' annual patient volume that were OA. Outcomes were a composite of 90-day major morbidity and readmission, and failure-to-rescue. Restricted cubic splines visualized volume–outcome associations and categorized hospital OA volume proportion (low: 20%–35%; medium: 35%–45%; high: 45%–70%). Associations were examined using marginal multivariable logistic regression, accounting for potential confounders. **Results:** In total, 48 292 OA (mean

age 77.5 yr, 43.8% female, 9.5% frail) had cancer surgery (GI 66.3%, GU 17.8%, lung 15.9%). Mean annual hospital OA volume was 147 ± 115 cases with a mean hospital OA volume proportion of 35.6 ± 6.6%. A clinically meaningful relationship did not exist between OA volume proportion and outcomes. After adjustment, care at centres with higher OA proportions was not associated with a difference in the odds of the composite outcome (high: odds raio [OR] 0.97, 95% confidence interval [CI] 0.87–1.08; medium: OR 0.96, 95% CI 0.90–1.03) or failure-to-rescue (high: OR 1.07, 95% CI 0.80–1.42; medium: OR 1.15, 95% CI 0.99–1.34) relative to centres with low proportions. Similar findings were observed in subgroups of adults aged ≥ 80 years and frail OA. **Conclusion:** Hospitals' OA volume is not associated with short-term outcomes among older thoracoabdominal cancer surgery patients. As more OA undergo major cancer resections, these findings reinforce that all centres must be proficient at treating older patients to optimize care.

07

Attitudes of Canadian colorectal cancer care providers toward liver transplantation for colorectal liver metastases: a national survey. ***Woo Jin Choi*****,** ***Keegan Guidolin*****,** ***Filomena Servidio-Italiano*****,** ***Fayez Quereshy*****,** ***Gonzalo Sapisochin*****. From the University of Toronto.**

Background: Up to 50% of colorectal cancer (CRC) patients develop colorectal liver metastases (CRLM). The aim of this study was to gauge the awareness and perception of liver transplantation (LT) for nonresectable CRLM, and to describe the current referral patterns and management strategies for CRLM in Canada. **Methods:** Surgeons who provide care for patients with CRC were invited to an online survey through the Canadian Association of General Surgeons, Canadian Society of Colon and Rectal Surgeons, and the Canadian Society of Surgical Oncology. Thirty-seven surveys were included. **Results:** The most used management strategy for CRLM was to refer to a hepatobiliary surgeon for assessment of metastectomy (78%) and/or refer to medical oncologists for consideration of chemotherapy (73%). Most (84%) of the respondents reported that their level of knowledge about LT for CRLM was low, yet the perception of exploring the option of LT for nonresectable CRLM seemed generally favourable (81%). However, there was a clear demand for more level I clinical trial evidence for sufficient measurement of the risks, long-term outcomes, and comparison of living donor liver transplantation (LDLT) to alternative therapy options. The referral decision for consideration of LDLT for CRLM treatment seems to depend on patient-specific factors and the local HPB surgeon's recommendation. **Conclusion:** Informing CRC care providers about ongoing CRLM clinical trials and the most up-to-date evidence with educational materials on CRLM management may help raise the awareness of the LT option for nonresectable CRLM and increase referral rates. Future studies should involve more granular assessments of surgeons' opinions on this topic using well-designed qualitative studies with structured interviews leading to theme saturations.

08

Quality of narrative central and lateral neck dissection reports for thyroid cancer treatment suggests need for a national standardized synoptic operative template. ***Akie Watanabe*****,** ***Eitan Prisman*****,** ***Elliot Mitmaker*****,** ***Ross Walker*****,** ***Jonn Wu*****,** ***Anne Nguyen*****,** ***Sam Wiseman*****. From University of British Columbia (Watanabe, Prisman, Wu, Nguyen, Wiseman), McGill University (Mitmaker), and Queen's University (Walker).**

Background: Consistent documentation of anatomic structures in central (CND) and/or lateral neck dissections (LND) is important for effective communication between multidisciplinary teams. This study aimed to investigate the current completeness of CND and LND narrative operative reports. **Methods:** Twenty-nine surgeons from 6 provinces who treat malignant thyroid disease provided deidentified CND and LND narrative reports. Important report elements were identified based on recommended items from prior literature and summarized using descriptive statistics for both CND and LND (stratified by dissection level). **Results:** Among 53 CND reports, 66% and 17% documented level VI and VII dissections, respectively, and 25% did not indicate the level(s) of dissection. Other than the recurrent laryngeal nerve(s) (96%), status of critical structures including the carotid artery (43%), superior laryngeal nerve(s) (15%), and innominate artery(-ies) (9%) were insufficiently reported. Among 23 LND reports, 9%, 83%, 83%, 87%, and 61% documented level I, II, III, IV, and V dissections, respectively. Status of the sternocleidomastoid muscle (91%) and internal jugular vein (91%) were frequently reported across all dissection levels, while only 39% recorded the presence or absence of a chyle duct leak. For level I dissections (n = 2), the status of the submandibular gland(s), lingual nerve(s), and hypoglossal nerve(s) were reported 100% of the time. Similarly, the integrity of the spinal accessory nerve(s) (86%) was frequently reported for level V dissections (n = 14). In contrast, important structures such as the vagus nerve(s) (50%), cervical rootlets (27%), and occipital artery(s) (5%) for level II/III dissections (n = 22) and the thoracic duct (20%) for level IV dissections (n = 20) were inadequately reported. **Conclusion:** Current narrative operative reporting fails to consistently document the status of important structures dissected in the central and lateral necks. Development of an accepted standardized national synoptic operative template may enhance reporting completeness and facilitate improved quality of patient care across multidisciplinary teams.

09

Transoral endoscopic thyroidectomy vestibular approach (TOETVA): indications and technique. ***Bianka Saravana-Bawan*****,** ***Dennis Hong*****,** ***Michael Gupta*****,** ***Jesse Pasternak*****. From University Health Network (Saravana-Bawan, Pasternak), University of Toronto (Saravana-Bawan, Pasternak), St. Joseph's Healthcare (Hong, Gupta), and McMaster University (Hong, Gupta).**

Background: Thyroid surgery has progressed from large collar incisions to more cosmetically sensitive dimensions.

Nevertheless, scarring remains a prominent concern among patients specifically from communities where neck scar has substantial stigma. **Methods:** To address these concerns, alternatives to traditional approach were explored, such as trans-axillary and facelift approaches. These approaches, however, require robotic instrumentation, considerable extra training, and cutaneous incisions. Comparatively, transoral endoscopic thyroidectomy vestibular approach (TOETVA) uses common laparoscopic equipment and has minimal learning curve for endocrine surgeons trained in thyroid surgery and laparoscopy. **Results:** In a recent Johns Hopkins review, learning curve for TOETVA was noted to be 7–11 cases. Once learning curve has plateaued, TOETVA operative times are not significantly longer than that of traditional thyroidectomy, demonstrating an average of 78 v. 64 minutes for thyroid lobectomy and 135 v. 103 minutes for total thyroidectomy. This approach is comparatively easy for thyroid surgeons to learn as it employs the traditional thyroidectomy planes. Importantly, there are no increased risks of complications in comparison to traditional thyroidectomy as seen in the largest series. Paratracheal tissue, including parathyroid glands, are easily observed and the recurrent laryngeal nerves are visualized in a plane that represents a more favourable angle with magnified view than that of traditional open approach. **Conclusion:** Patient selection is key as benign nodules < 6 cm with thyroid lobe no larger than 10 cm are recommended for TOETVA. As expertise and familiarity increases, these limits may be pushed. Originally performed for benign disease alone, TOETVA is now also performed for small (< 2 cm), well-differentiated thyroid cancers. In addition to these criteria, patients with a short mental distance and good neck extension should be considered. The only contraindication to TOETVA is the inability to tolerate surgery or general anesthetic.

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Temporal trends in lymph node assessment as a quality indicator in colorectal cancer patients treated at a high-volume Canadian centre. ***David Cyr*****,** ***Omar Vergara-Fernandez*****,** ***Amanpreet Brar*****,** ***James Conner*****,** ***Richard Kirsch*****,** ***Mantaj Brar*****,** ***Erin Kennedy*****,** ***Anand Govindarajan*****,** ***Robert Gryfe*****,** ***Helen MacRae*****,** ***Zane Cohen*****,** ***Robin McLeod*****,** ***Carol Swallow*****. From University of Toronto (Cyr, A. Brar, M. Brar, Kennedy, Govindarajan, Gryfe, MacRae, McLeod, Swallow), El Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán (Vergara-Fernandez), Mount Sinai Hospital (Conner, Kirsch), and Zane Cohen Centre for Digestive Diseases (Cohen).**

Background: Clinical practice guidelines have been developed to improve surgical quality and optimize cancer-specific survival. Adequate lymph node assessment (LNA) is a key quality indicator in patients with colorectal cancer (CRC) who undergo resection, and depends on both surgical technique and pathologic retrieval. National Cancer Institute (2001) and Cancer Care Ontario (2005) guidelines stipulate that a minimum of 12 LNs should be assessed. **Methods:** We examined compliance with this standard at our institution over time. Patients were grouped according to date of surgery: t1 (1997–2001), t2 (2002–2006), and t3 (2011–2016). Each group included consecutive patients who underwent resection of primary CRC at Mount Sinai Hospital, Toronto. **Results:** The entire study cohort comprised 1412 patients (623 female, 789 male, median age 65 yr [range 20–98]). There were no observed differences across time periods for patient (sex, age) or tumour (TNM stage, resection margin status) features. Adequacy of LNA markedly improved over time for both colon and rectal primary sites ($p < 0.0001$). Of note, the proportion of cases done urgently/emergently actually increased in t3 (9%) v. t1 (6%) and t2 (4%) ($p = 0.04$). Thirty-two cases in the t3 period did not have adequate LNA (18 rectal, 14 colon); 100% of rectal cases had received neoadjuvant treatment, and the majority of colon cases were stage IV (57%) at the time of primary resection. Here, we show that the implementation of Cancer Care Ontario guidelines resulted in markedly improved lymph node assessment at a tertiary cancer centre. **Conclusion:** These results support the effectiveness of clinical practice guidelines in improving achievement of quality indicators for CRC surgery. Compliance with recommendations for adjuvant therapy in patients with node-positive disease requires further study.

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Molecular landscape of early-stage breast cancer with nodal metastasis. ***Muriel Brackstone, Farhad Ghasemi*****. From Western University.**

Background: The presence of axillary lymph node metastasis is an important prognostic factor in breast cancer and serves as the basis of important treatment decisions such as neoadjuvant or adjuvant systemic therapy. Clinical evaluation of axilla lymphadenopathy is inaccurate, leading to sentinel lymph node biopsies (SLNBs) to stage the disease. SLNB is associated with morbidity for the patients, excludes the possibility of future SLNB, and requires health care resources. As such, a better understanding of molecular processes leading to axillary metastasis in breast cancer is important and can aid us in preoperative prediction of nodal involvement. **Methods:** A multiplatform comparison of early-stage breast tumours (≤ 5 cm) in patients undergoing SLNB was compared using data from The Cancer Genome Atlas (TCGA) project. The comparison between 250 node-negative and 162 node-positive early-stage breast tumours revealed 766 statistically significant differentially expressed mRNAs and 40 differentially expressed miRNAs. Distinct heterogeneity existed among the 4 molecular subtypes (Luminal A, Luminal B, Basal, Her2) of breast cancer. Only 33.2% of the discovered differentially expressed mRNAs were either overexpressed or underexpressed consistently across all subtypes with nodal involvement. **Conclusion:** Pathway enrichment analysis highlighted several pathways, including immune response and chromatin assembly. There were no statistically significant differences in single nucleotide variations, copy number alterations or protein expression between node-negative and node-positive patients. The potential molecular signatures identified in this study may prove valuable in the development of predictive models of axillary involvement and highlight the importance of a subtype-specific approach to breast cancer.

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Beta testing of a risk-stratified patient decision aid to facilitate shared decision making for postoperative extended thromboprophylaxis in patients undergoing major abdominal surgery for cancer. ***Victoria Ivankovic*, *Megan Delisle*, *Dawn Stacey*, *Jad Abou-Khalil*, *Fady Balaa*, *Kimberly Bertens*, *Brittney Dingley*, *Guillaume Martel*, *Kristen McAlpine*, *Carolyn Nessim*, *Shabeer Tadros*, *Marc Carrier*, *Rebecca Auer*. From University of Ottawa (Ivankovic, Delisle, Balaa, Dingley, Tadros), Ottawa Hospital Research Institute (Stacey, Abou-Khalil, Bertens, Martel, Nessim, Carrier, Auer), and University of Toronto (McAlpine).**

Background: We previously developed a novel patient decision aid (PtDA) to facilitate shared decision making between patients and clinicians when deciding whether to use extended-duration thromboprophylaxis or not for 4 weeks after major abdominopelvic surgery for cancer. Our PtDA was found to be acceptable with patients and clinicians. The objective of this study was to build on our previous work by evaluating the effectiveness of our PtDA. **Methods:** Patients undergoing major abdominal surgery for cancer at an academic centre were enrolled in this pre-/post-test study. Institutional ethics approval was obtained. All outcomes were measured using previously psychometrically validated surveys. The primary outcome was change in decisional conflict. Secondary outcomes included readiness to make a decision, confidence in decision making, and change in patient knowledge of the health care decision. A sample size calculation determined a total of 17 patients were required to demonstrate the PtDA meaningfully reduced decisional conflict using a paired *t* test. **Results:** A total of 17 patients were recruited. The median age was 68 years (range 28–82) and the majority of patients were male (13 of 17, 76.5%). Based on the Caprini Score, 1 patient was low risk, 6 were moderate risk, 5 were high risk, and 5 were very high risk for developing a venous thromboembolism. The median pre-PtDA decisional conflict score was 2.4, compared with a post-PtDA score of 1.3 ($p < 0.01$). The median score for confidence in decision-making was 86.4, corresponding to high confidence. Median knowledge scores increased from 50% to 75%. Median score for readiness to make a decision following the PtDA was 90, indicating a high perceived level of preparedness to make a decision. **Conclusion:** The PtDA significantly reduced decisional conflict and was effective at improving the parameters of patients' decision-making abilities. Patients demonstrate high confidence for decision making, and indicate they are prepared to decide after using the PtDA.

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Breast reconstruction use and impact on oncologic outcomes among inflammatory breast cancer patients: a systematic review. ***Ananya Gopika Nair*, *David Lim*. From University of Toronto.**

Background: Breast reconstruction is generally discouraged in women with inflammatory breast cancer (IBC) owing to concerns about recurrence and poor long-term survival. We aimed to determine contemporary trends and predictors of breast reconstruction and its impact on oncologic outcomes among women with IBC. **Methods:** A comprehensive literature search for all studies published up to Feb. 1, 2022, via MEDLINE, Embase, and the Cochrane Library using MeSH and EMTREE headings with free text combinations was conducted. Randomized controlled trials and cohort studies comparing women diagnosed with IBC undergoing a mastectomy with or without breast reconstruction were evaluated. **Results:** The initial search yielded 203 studies, of which 8 retrospective cohort studies, reporting 2393 cases of breast reconstruction in 24 982 women with IBC, were included. In the past 2 decades, reconstruction rates have risen from 6.3% to 12.3%, with younger age, higher income ($25 000–$75 000 USD), private insurance, living in metropolitan areas and undergoing bilateral mastectomy being associated with reconstruction. While lower co-morbidity index was associated with reconstruction, other clinicopathologic data, including stage, grade, margin, and lymph node status, were not independent predictors. Most studies found no difference in overall survival, breast-cancer specific survival or recurrence between women undergoing versus not undergoing reconstruction. Median survival ranged from 22 to 87 months, with 5-year survival rates between 57.2% and 59%. Immediate breast reconstruction was associated with an increased risk of postoperative complications, including infections, delayed wound healing, and longer hospital stay, when compared with no or delayed reconstruction. However, there was no association between breast reconstruction and delays in starting adjuvant treatment. Time to postmastectomy radiation varied from 52.5 to 56.5 days for immediate reconstruction and 45 to 90 days for delayed breast reconstruction. **Conclusion:** Breast reconstruction after mastectomy may be an acceptable consideration for select patients with IBC who desire the procedure, as it is not associated with worse oncologic outcomes.

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Association between patient-reported symptoms and health care resource utilization: a first step to develop patient-centred value measures in cancer care. ***Dhruvin Hirpara*, *Antoine Eskander*, *Natalie Coburn*, *Rinku Sutradhar*, *Wing Chan*, *Julie Hallet*. From University of Toronto (Hirpara), Sunnybrook Health Sciences Centre (Eskander, Coburn, Hallet), and ICES (Sutradhar, Chan).**

Background: Value of care is defined as patient-relevant outcomes achieved per dollar spent. Patient-reported outcomes (PROs) offer a unique lens into cancer care; their relationship with cost and resource utilization, however, is yet to be defined. We examined the association between PROs and health resource utilization (HRU) in the year after cancer diagnosis, with a view to develop PRO-based measures of value. **Methods:** We conducted a population-based cohort study of adults with cancer (2008–2019). The exposure was symptom burden measured using Edmonton Symptom Assessment System (ESAS) scores. The outcome was total health care cost within 30 days of ESAS reporting, as a metric for HRU. HRU was further stratified into cancer-directed therapies (i.e., chemotherapy and radiation) or ancillary services including emergency department visits, complex continuing care, home care, and inpatient mental health. Linear

regression models with log-transformed costs examined the association between ESAS scores and outcomes adjusting for potential confounders. **Results:** We analyzed 1728025 ESAS surveys from 285924 patients. Gastrointestinal, breast and central nervous system cancers were the most resource-intensive cancers, with median 30-day costs after ESAS of $85 000, $81 000, and $78 000 (CAD), respectively. Each 10-point increase in total ESAS score (0–90) was associated with a 9.4% decrease in the cost of cancer-directed therapies. Conversely, each 10-point increase was associated with an 18% increase in costs of ancillary care. **Conclusion:** High symptom burden was associated with decreased use of cancer-directed therapy but increased use of ancillary care, indicating interruptions to oncologic treatment. Proactive symptom management may mitigate unnecessary HRU and facilitate cancer-directed therapies. Future work will further explore the relationship between PROs and HRU/costs to develop a PRO-based measure of value in cancer care.

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Complications after colorectal liver metastases resection in Newfoundland and Labrador. ***Cecily Stockley*****,** ***Felicia Pickard*****,** ***Alexander Mathieson*****,** ***Michael Hogan*****,** ***Melanie Seal*****. From Memorial University of Newfoundland.**

Background: Newfoundland and Labrador has the highest incidence of colorectal cancer in Canada. The resection of colorectal liver metastases (CLMs) can confer a survival benefit. In view of volume outcome data, monitoring outcomes is essential. The objective of this study was to assess the surgical morbidity and mortality associated with CLM resection in Newfoundland and Labrador. **Methods:** A retrospective cohort study of patients who underwent CLM resection between 2002 and 2018 was completed. Descriptive statistics were derived with SPSS. **Results:** In total, 172 patients underwent resection of CLM. The majority were male (57.0%) with a median age of 62 years. Eighty-two patients had 4 or more segments resected, 38 of whom had portal vein embolization. The average length of stay was 8.4 days, and the 30-day readmission rate was 7.0%. The overall morbidity rate was 27.3%. In total, 14.0% of complications were managed medically, including transient liver insufficiency (2.3%), wound infection (4.1%), pulmonary embolism (1.7%), pneumonia (1.7%), ileus (1.7%), and other (2.5%); 11.0% of complications were managed with an interventional procedure. There was a bile leak rate of 4.7%, all of which were managed with endoscopic retrograde cholangiopancreatography stenting. Reoperations were required in 2.3% of patients, including hepaticojejunostomy (n = 2), wound dehiscence (n = 1) and intra-abdominal sepsis (n = 1). The 30-day mortality rate was 2.9%, with 1 death in the most recent 10 years of the study period. Deaths were due to hepatic failure (n = 3) and cardiorespiratory events (n = 2). **Conclusion:** All bile leaks, reoperations, and deaths secondary to liver failure occurred in patients who had 4 or more liver segments resected. CLM resection in Newfoundland and Labrador has similar morbidity and mortality rates when compared with other larger centres. CLM resections can safely be performed in smaller centres where surgical expertise exists.

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Why do patients with nonmetastatic primary retroperitoneal sarcoma not undergo resection? ***Deanna Ng*****,** ***Belkacem Acidi*****,** ***Wendy Johnston*****,** ***Dario Callegaro*****,** ***Savtaj Brar*****,** ***Rebecca Gladdy*****,** ***Peter Chung*****,** ***Charles Catton*****,** ***Korosh Khalili*****,** ***Charles Honore*****,** ***Carol Swallow*****. From University of Toronto (Ng), Gustabe Roussy (Acidi, Honore), Mount Sinai Hospital (Johnston, Brar, Gladdy, Swallow), Istituto Nazionale dei Tumori (Callegaro), Princess Margaret Cancer Centre (Chung, Catton), and University Health Network (Khalili).**

Background: Resection is the mainstay of management of primary retroperitoneal sarcoma (RPS), but an unknown proportion of patients do not undergo resection even though the tumour is localized. Very few centres systematically collect data regarding RPS patients who do not come to resection. **Methods:** We investigated the incidence of and underlying reasons for nonresection, using prospectively maintained data from 2 high-volume sarcoma centres. **Results:** Consecutive patients who presented with primary RPS and no distant metastases on staging imaging were included (n = 276; 2012–2017). Of these, 188 (69%) underwent resection, while 88 (31%) did not. Patients who did not have resection were older, and approximately half had significant comorbidities (n = 46) and/or poor performance status (n = 41). Interestingly, the median maximum tumour size was smaller in the nonresected cohort. The 88 patients who did not undergo resection were divided into 3 groups. Group A (n = 23) were patients deemed technically unresectable owing to extensive involvement of the superior mesenteric artery, portal vein, aorta, spinal canal or mediastinum. Group B (n = 40) comprised patients who received either no (n = 29) or brief (n = 11) active treatment, with no short-term (3 mo) progression of disease. Group C (n = 25) were patients who progressed on what was planned to be cytoreducing preoperative treatment (chemotherapy and/or radiation therapy) (n = 25). For the entire cohort of 88 nonresected patients, median overall survival (OS) was 13 months and 3-year OS was 35% (95% confidence interval 25%–48%). Patients in group A (technically unresectable) and group B (no progression) had similar OS, but group C (progression on treatment) showed a rapid decline in OS. **Conclusion:** Nearly one-third of patients who presented with nonmetastatic primary RPS did not ultimately undergo resection. Progression of disease on planned preoperative treatment was associated with very limited survival, revealing adverse biology. The ability to predict early progression would facilitate adaptive response to guide innovative therapeutic approaches.

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Loss of *FAM46C* expression predicts inferior postresection survival and induces ion channelopathy in gastric adenocarcinoma. ***Shelly Luu*****,** ***Ning Fu*****,** ***Karineh Kazazian*****,** ***Karina Pacholczyk*****,** ***Deanna Ng*****,** ***Jossie Swett-Cosentino*****,** ***Paul Savage*****,** ***Yukiko Shibahara*****,** ***Sangeetha Kalimuthu*****,** ***Osvaldo Espin-Garcia*****,** ***James Conner*****,** ***Jonathan Yeung*****,** ***Gail Darling*****,** ***Carol Swallow*****. From University of Toronto (Luu, Kazazian, Ng, Savage, Kalimuthu, Espin-Garcia, Conner, Yeung, Swallow), University of Ottawa (Fu),**

Lunenfeld-Tanenbaum Research Institute (Pacholczyk), Brockville General Hospital (Swett-Cosentino), Kitasato University School of Medicine (Shibahara), and Dalhousie University (Darling).

Background: More precise delineation of recurrence risk and pattern would facilitate personalized use of adjunctive therapies in patients with gastric adenocarcinoma (GCa). Our aim was to discover high-fidelity markers of risk and novel therapeutic targets. **Methods:** Tumour (T) and paired normal mucosa (NM) samples were microdissected from curatively resected GCa specimens from 158 patients (2001–2017). RNA was extracted and differential gene expression correlated with patient outcome. Disease-specific survival (DSS) was estimated using the Kaplan–Meier method and hazard ratios estimated with Cox regression. **Results:** Median age of the study cohort was 70 years, with a median postresection follow-up time of 31 months (interquartile range 12–73) and 3-year DSS of 66%. **Conclusion:** We explored potential markers of recurrence risk by performing a directed screen of 55 members of the oncogene *Plk4* interactome. This revealed reduced expression of the nucleotidyl transferase *FAM46C* in tumour tissue in 94% of patients. Retention of *FAM46C* expression (T/NM ≥ median, n = 79) was associated with superior 3-year DSS (75% v. 57% in T/NM).

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Liver-directed therapy of neuroendocrine liver metastases. ***Léamarie Meloche-Dumas*, *Frédéric Mercier*, *Victoria Barabash*, *Calvin Law*, *Natalie Coburn*, *Simron Singh*, *Sten Myrehaug*, *Wing Chan*, *Julie Hallet*. From Université de Montréal (Meloche-Dumas), Centre hospitalier de l'Université de Montréal (Mercier), Sunnybrook Research Institute (Barabash), Sunnybrook Health Sciences Centre (Law, Coburn, Singh, Myrehaug, Hallet) and ICES (Chan).**

Background: The optimal therapy sequencing for metastatic neuroendocrine tumours (NETs) remains undefined. Recent advances in systemic therapies may have changed approaches. Better understanding in patterns of care is necessary to assess and design treatment strategies. **Methods:** We examined the use of factors associated with liver-directed therapy over time. We conducted a population-based study of metastatic NETs over 2000–2019. Outcomes were use of liver-directed therapy, subdivided into liver resection and embolization. Bi-yearly incidence rate of use in eligible patients (alive and no prior liver-directed therapy) was assessed. Multivariable Poisson models examined factors associated with use of liver-directed therapies. **Results:** Of 5159 metastatic NETs, 922 patients (16.7%) received liver-directed therapy (461 embolizations, 329 resections, 132 dual therapy) at a median of 35 days (interquartile range 0–490) after metastatic diagnosis. Incident use of liver embolization increased after 2013 to reach 72% in 2018–19. Incident use of liver resection followed a similar trajectory up to 94% in 2018–19. Gastro-entero-pancreatic primary NET (relative risk [RR] 5.69, 95% confidence interval [CI] 3.76–8.60), female sex (RR 1.25, 95% CI 1.05–1.48), year of diagnosis (RR 1.32, 95% CI 1.04–1.68 for 2007–2015), and lower socioeconomic status (RR 0.93, 95% CI 0.87–0.98 by incremental material deprivation quintile) were independently associated with liver resection. Gastro-entero-pancreatic primary NET (RR 2.8, 95% CI 2.2–3.7), socioeconomic status (RR 0.94, 95% CI 0.89–0.99 by quintile) and year of diagnosis (RR 0.71, 95% CI 0.59–0.85 for 2007–15 and RR 0.61, 95% CI 0.50–0.75 for 2016–2020) were independently associated with risk of liver embolization. **Conclusion:** Receipt of liver-directed therapies for metastatic NETs has increased over time in unadjusted analysis. However, there was lower risk of liver embolization in most recent time periods, but higher risk of resection. Socioeconomic status represented an independent factor for lower likelihood of liver-directed therapies. Further characterization of timing and outcomes of liver-directed therapy, with an equity lens, is warranted to define the optimal sequencing.

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Neoadjuvant pembrolizumab use in microsatellite instability high (MSI-H) rectal cancer: benefits of its use in lynch syndrome. ***Michael A. D'Elia*, *Rebecca C. Auer*. From University of Ottawa (D'Elia), Ottawa Hospital Research Institute (Auer), and The Ottawa Hospital (Auer).**

Background: Precision medicine is increasingly becoming the new normal for the treatment of various oncological diseases. Targeted therapy, and more recently immunological therapy, have entered mainstream oncologic treatments and are being shown to be increasingly beneficial. Immunotherapy is useful in treating a wide variety of tumour types. Recently, pembrolizumab, a PDL-1 inhibitor, has been shown to be effective in treating microsatellite instability (MSI) high tumours. Within the metastatic setting for colorectal cancer, it has been shown to be superior to standard treatment, with an improved progression-free survival compared with chemotherapy. Furthermore, there was a significant rate of complete radiographic responses. **Methods:** Here we present the first case of neoadjuvant administration of pembrolizumab for curative intent in a young man with Lynch syndrome diagnosed with rectal cancer. **Results:** After initial presentation of a T3cN+ lesion, pembrolizumab was started, allowing for radiographic downstaging to a T3bN– lesion. With this improvement, a total proctocolectomy and ileoanal pouch anal anastomosis (IPAA) was performed and demonstrated a complete pathological response on final pathology. The ability to create an IPAA prevented a permanent ileostomy in a 20-year-old male, improving his long-term quality of life. **Conclusion:** This case demonstrates that pembrolizumab can successfully be employed alone in the neoadjuvant setting with good results. Importantly, as demonstrated here, its use can have dramatic impacts on quality of life. Despite the lack of randomized control trials using pembrolizumab in the neoadjuvant setting, there is already significant amount of work demonstrating the benefits of immunotherapy. It is time to think about using this treatment to its maximal benefit and here we highlight the opportune patient population.

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MOLLI for excision of nonpalpable breast lesions: a case series. ***Ashley Eom*, *Narry Muhn*, *Barbara Heller*, *Peter Lovrics*. From McMaster University.**

Background: Nonpalpable breast lesions require intraoperative localization. Magnetic Occult Lesion Localization Instrument (MOLLI) is a novel localization technique that employs ferromagnetic marker technology, detected through a hand-held probe for intraoperative lesion localization, without the limitations of radioactive seeds or wire localizations. **Methods:** We examined the clinical outcomes of MOLLI-guided localization of nonpalpable breast lesions at a single institution. A consecutive sample of 30 patients with nonpalpable breast lesions underwent lumpectomy with or without sentinel lymph node biopsy. MOLLI markers were placed preoperatively by a breast radiologist under sonographic or stereotactic mammogram guidance. The hand-held probe was used to localize the marker signal intraoperatively. Complete excision of the marker and lesion were confirmed with specimen radiography. Patient demographics, operative and pathological data were collected retrospectively from electronic medical records. **Results:** Seven of 30 patients had multifocal disease requiring multiple markers. One patient had bilateral lesions. One patient failed marker placement as it did not deploy within a cystic lesion. Thus, a total of 29 patients and their 36 lesions were analyzed and summarized. One pathologic margin was involved by ductal carcinoma in situ, but clear of invasive carcinoma. Marker migration did not occur. Postoperatively, 2 patients developed cellulitis and 1 patient developed hematoma. **Conclusion:** Our study is the second series to demonstrate the MOLLI marker to be an effective alternative to radioactive seeds in the localization of nonpalpable breast lesions. All markers were successfully identified and yielded surgical specimen with margins clear of invasive carcinoma. The markers were placed up to 47 days preoperatively without complications, allowing for flexibility in scheduling without the resources required for radiation safety. One marker failed to deploy within a cystic lesion; the deployment mechanism was subsequently altered to correct this. The novel MOLLI technology guides surgery with dynamic audible signals, visual guidance, and precise distance measurements, enabling efficient localization.

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Patients awaiting mastectomy report increased depression, anxiety, and decreased quality of life compared with patients awaiting lumpectomy for treatment of breast cancer. ***Katelynn Tang*. From University of British Columbia.**

Background: There is a trend to increasing mastectomy for treatment of breast cancer despite studies demonstrating equivalent survival and better postoperative outcomes with lumpectomy. There is a need to better understand the constellation of physical and mental health conditions patients face in the preoperative period. **Methods:** This study's objective was to measure aspects of patients' preoperative mental health and identify differences between patients scheduled for mastectomy and lumpectomy. This study was based on a prospectively recruited cohort of consecutive patients scheduled for breast cancer surgery at our institution between April 2016 and July 2020. Preoperatively, participants completed a survey that included the Patient Health Questionnaire-9 (PHQ-9) for depression, the General Anxiety Disorder-7 (GAD-7) for anxiety, the pain intensity (P), interference with enjoyment of life (E), and interference with general activity (G), known as the PEG, for pain and the EQ-5D(5L) for health status. Participants also reported their chronic health conditions. Scores were calculated for each instrument and compared for mastectomy and lumpectomy. **Results:** The overall response rate was 31%, with 667 participants. Average age was 59 years. The most common comorbidities were hypertension (27%), arthritis (24%) and depression (13%.) Among participants, 477 were scheduled for lumpectomy (71.5%) and 190 were scheduled for mastectomy (28.5%). Mastectomy patients reported more severe symptoms of anxiodepressive disorders with higher levels of depression (5.3 v. 4.2, $p < 0.01$) and anxiety (5.7 v. 3.9, $p < 0.01$). There were no differences in pain. Participants scheduled for lumpectomy reported high health status compared with participants scheduled for mastectomy (75.0 v. 70.7, $p < 0.01$). Patients scheduled for mastectomy reported more severe symptoms of depression and anxiety than those scheduled for lumpectomy. **Conclusion:** This information will be useful when counselling patients about surgical options. Preoperative referral to mental health providers may offer an opportunity to enhance perioperative care.

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Is microscopic margin status important in retroperitoneal sarcoma (RPS) resection? A systematic review and meta-analysis. ***Shawn Khan*, *Deanna Ng*, *Daniel Koerber*, *Eisar Al-Sukhni*, *David Cyr*, *Karineh Kazazian*, *Carol Swallow*. From University of Toronto (Khan, Ng, Al-Sukhni, Cyr, Kazazian, Swallow) and University of Alberta (Koerber).**

Background: Resection with circumferentially clear microscopic margins (R0) is challenging to achieve in primary retroperitoneal sarcoma (RPS), given the typical proximity to central compartment anatomy. While grossly incomplete resection (R2) predicts poor survival, there is no consensus among international expert sarcoma surgeons as to whether microscopic margin status actually influences outcome. **Methods:** We conducted a systematic review and meta-analysis to compare outcomes of patients undergoing R0 v. R1 (microscopically involved margins) resection of primary RPS, in accordance with PRISMA guidelines. We searched MEDLINE, Embase, Cochrane, and CINAHL in duplicate, from database inception to Dec. 12, 2021, for original studies that reported outcomes of patients who underwent R0 or R1 resection, including as end points rate of any recurrence and overall survival. Meta-analysis was performed using a fixed-effects model, and results are presented as cumulative hazard ratios (HRs). **Results:** A total of 33 studies directly compared R0 and R1 resection of primary RPS, describing in aggregate the outcomes of 25 496 resections (R0 56.1%, R1 27.4%, R2 3.4%, unknown 13.1%). A total of 26 studies were eligible for meta-analysis. Comparing R1 to R0, the cumulative HR for recurrence was 2.07 (95% confidence interval [CI] 1.87–2.26, $p < 0.0001$). Comparing R0 to R1, the cumulative HR for overall survival was 1.44 (95% CI 1.37–1.50, $p < 0.0001$). **Conclusion:** These results demonstrate that R0 resection of primary RPS is associated with lower risk of recurrence and better long-term survival compared with R1 resection. Whether this is attributable to technical achievement of a negative microscopic margin, or to confounding features such as better tumour biology, requires further consideration.

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Absence of benefit of routine surveillance in very-low-risk and low-risk gastric gastrointestinal stromal tumors. ***Erika Schmitz, Sameer Apte, Carolyn Nessim*. From University of Ottawa (Schmitz, Apte) and The Ottawa Hospital (Nessim).**

Background: Gastric gastrointestinal stromal tumours (GISTs) are mesenchymal neoplasms with heterogeneous malignant behaviour. Adjuvant therapy and routine surveillance are guided by the risk of recurrence, which is largely determined by tumour location, mitotic rate, size and intraoperative tumour rupture. Recurrence after surgical resection of very-low-risk and low-risk gastric GISTs is exceedingly rare. Despite this, the National Comprehensive Cancer Network suggest abdominopelvic cross-sectional imaging every 3–6 months for 3–5 years then annually, while the European Society for Medical Oncology states that routine follow-up may not be warranted in very-low-risk GIST and the benefit of routine follow-up is not known. Consequently, the aim of this study was to characterize the patterns of recurrence among the low-risk and very-low-risk gastric GISTs and determine the value of surveillance at our centre. **Methods:** Adult patients with gastric GIST who underwent surgical resection at a single tertiary care centre between 2010 and 2020 were evaluated. Demographics, clinical presentation, radiologic and endoscopic findings, pathological results and surveillance data were collected and analyzed. **Results:** In total, 139 patients underwent resection of a gastric GIST and were eligible for inclusion. According to the National Institute of Health modified classification system, 8.6% (n = 12) were considered very low risk, 37.4% (n = 52) low risk, 36% (n = 50) intermediate risk and 18% (n = 25) high risk. We observed 1 recurrence in the intermediate-risk group at 4 years (2%) and 2 within the high-risk group at 2 and 3 years (8%), all of which were nonperforated, asymptomatic and detected on routine surveillance imaging. Among the very-low-risk group, 3 were discharged to their family physician for surveillance, and the remaining 77.8% (n = 7) underwent surveillance with cross-sectional abdominal imaging and 33.3% (n = 3) with additional chest imaging, respectively. Among the low-risk group, 10 patients were discharged to their family physician for surveillance, and the remainder 57.1% (n = 24) underwent surveillance with cross-sectional abdominal imaging and 30.9% (n = 13) with additional chest imaging, respectively. Nine patients of the low-risk group underwent endoscopic surveillance. **Conclusion:** After a median of 37.1 and 34.3 months of surveillance within the very-low-risk and low-risk groups, we observed no recurrences and detected no additional malignancies. There were no recurrences of very-low-risk and low-risk gastric GISTs after surgical resection in this single-site population. While considering cost-effectiveness and in the absence of randomized controlled trials, this evidence may support that routine radiologic and endoscopic surveillance may not be warranted among these subgroups.

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Effect of intraoperative in-room specimen radiography on margin status in breast-conserving surgery. ***Ko Ta Chen, Judy Ban, Leo Chen, Elaine McKevitt, Rebecca Warburton, Jin-Si Pao, Carol Dingee, Urve Kuusk, Amy Bazzarelli*. From University of British Columbia.**

Background: Intraoperative in-room specimen radiography (IRSR) allows for immediate in-theatre mammographic determination of specimen margin status in breast-conserving surgery (BCS) for breast cancer. It has been demonstrated to be equivalent or superior to the traditional specimen radiography (SR) in detecting margin positivity. This retrospective study aimed to examine the impact of replacing SR with IRSR at a tertiary institution on positive margin rates, reoperation rates, and excised volume of wire-localized BCS. **Methods:** Our study reviewed 794 consecutive BCS with wire-localization identified from a prospectively maintained database at a breast centre in Canada from January 2017 to December 2019. The effect of IRSR compared with SR on positive margin and reoperation rates were evaluated using univariate regression, while excised tissue volumes were evaluated using linear regression. **Results:** The analysis demonstrated no statistically significant reduction in overall positive margin rates, reoperation rates, and excised tissue volume in wire-localized BCS after the introduction of IRSR. However, there was a trend toward reduction in close (< 2 mm) or positive margin rates (odds ratio [OR] 0.61, 95% confidence interval [CI] 0.33–1.12, p = 0.11), and reoperation rates (OR 0.61, 95% CI 0.32–1.14, p = 0.12) in patients whose lumpectomy showed pure ductal carcinoma in situ (DCIS). A statistically significant reduction in reoperation rates (OR 0.45, 95% CI 0.23–0.86, p = 0.019) in patients who underwent preoperative stereotactic biopsy was also noted. Statistically significant increased excised tissue volume with IRSR was found in patients with invasive cancers. **Conclusion:** Our study revealed that IRSR at our centre correlated with a trend toward decreased margin positivity and reoperations in the DCIS subgroup, with corresponding statistically significant reduction in reoperations of breast cancers confirmed on stereotactic biopsy, the modality often used for sampling of calcifications most common in DCIS. Further study is needed to elucidate the increase in excised tissue volume.

26

Active surveillance for DCIS of the breast: qualitative interviews with patients and physicians. ***Jieun Newman-Bremang, Nicole Look Hong, Anna Gagliardi, Bryanna Nyhof*. From University of Toronto.**

Background: Multiple international trials are currently investigating the safety of active surveillance (AS) for low-risk ductal carcinoma in situ (DCIS), where surgical excision is offered only in the case of progression to invasive cancer. The objective of this study was to explore views on acceptability of AS for low-risk DCIS from DCIS survivors and physicians. **Methods:** Women with a history of DCIS were recruited using purposive sampling and interviewed in 5 focus groups. Concurrently, physicians specializing in breast cancer care were recruited via purposive and snowball sampling and interviewed via semistructured telephone interviews. All interviews were conducted using interview guides that were created and pilot tested as part of a larger study on patient-centred care on DCIS. The responses were recorded and transcribed verbatim. Data were analyzed iteratively with qualitative descriptive analysis and constant comparative analysis was used to extract dominant themes. **Results:** We interviewed a total of 35 women in 5 focus groups

held in 5 provinces in Canada (British Columbia, Alberta, Saskatchewan, Ontario, Nova Scotia) as well as 40 physicians from general surgery, surgical oncology, medical oncology, radiation oncology and radiology. The majority of DCIS survivors and physicians were hesitant toward AS, and risk of missed invasive disease was the top concern of both patients and physicians. Both groups recognized that it is not yet the standard of care and addressed the need for tools to predict the risk of progression before recommending AS. **Conclusion:** The DCIS survivors and physicians were overall aligned in their hesitancy for AS in its current state. If AS were to be proven to be safe, these important considerations should be included for an effective implementation of AS for DCIS.

CANADIAN HEPATO-PANCREATO-BILIARY ASSOCIATION

01

Outcomes following extrahepatic and intraportal pancreatic islet transplantation: a comparative cohort study. ***Kevin Verhoeff, Braulio Marfil-Garza, Gurpal Sandha, David Cooper, Khaled Dajani, David Bigam, Blaire Anderson, Tatsuya Kin, Anna Lam, Doug O'Gorman, Peter Senior, Camillo Ricordi, A.M. James Shapiro.*** **From University of Alberta (Verhoeff, Marfil-Garza, Sandha, Dajani, Bigam, Anderson, Kin, Lam, O'Gorman, Senior, Shapiro), University of Pittsburgh (Cooper), and University of Miami (Ricordi).**

Background: Preliminary studies show promise for extrahepatic islet transplantation (ITx). However, clinical comparisons with intraportal ITx outcomes remain limited. We aimed to compare short-term glycemic outcomes for patients receiving extrahepatic and intraportal ITx. **Methods:** This single-centre cohort study evaluates patients receiving extrahepatic or intraportal ITx between 1999 and 2018. Primary outcome was stimulated C-peptide level. Secondary outcomes were fasting plasma glucose (FPG), BETA-2 scores, and fasting C-peptide level. **Results:** Of 265 patients, 9 (3.5%) received extrahepatic ITx (2 gastric submucosal, 3 subcutaneous, 4 omental). Group demographics were similar at baseline (age, body mass index, diabetes duration, and glycemic control). At 1–3 months after first infusion, patients receiving extrahepatic ITx had significantly lower stimulated C-peptide (0.05 nmol/L v. 1.2 nmol/L, $p < 0.001$), higher FPG (9.3 mmol/L v. 7.3 mmol/L, $p < 0.001$), and lower BETA-2 scores (0 v. 11.6, $p < 0.001$) and SUITO indices (1.5 v. 39.6, $p < 0.001$) compared with those receiving intraportal ITx. **Conclusion:** Patients receiving extrahepatic grafts failed to produce median C-peptide ≥ 0.2 nmol/L within the first 60 days after transplant. Subsequent intraportal infusion following extrahepatic transplants achieved equivalent outcomes compared with patients receiving intraportal transplant alone. Using current techniques, intraportal islet infusion remains the gold-standard for clinical ITx, with superior engraftment, graft function and glycemic outcomes compared with extrahepatic transplantation of human islets.

02

Cholang-funga-gitis. ***Nic Jette, Michael Moser.*** **From the University of Saskatchewan.**

Background: Biliary stasis is a common finding among patients who present to consultant surgical services. The most common etiology is debris or a stone originating from the gallbladder; however, there are additional entities that can arise within the biliary system that can lead to clinical and biochemical biliary obstruction. One of these rare causes, biliary casts, are well documented in liver transplant patients but are otherwise uncommon. **Methods:** Here, we report the case of a patient with situs inversus and multiple concomitant complex medical conditions who presented with sepsis. Subsequent laboratory and clinical examinations suggested cholangitis as a potential source, although initial imaging was grossly uninformative. **Results:** Follow-up imaging suggested that a distal common bile duct stone was the cause for the obstruction. Endoscopic retrograde cholangiopancreatography was attempted but was unsuccessful owing to aberrant patient anatomy. An open common bile duct exploration, complicated by patient anatomy and previous surgeries, revealed the presence of a biliary cast with a significant fungal component requiring intravenous postoperative antifungal medication. **Conclusion:** Biliary stasis, without a clear cause for obstruction and/or contradictory imaging, should prompt consideration of more atypical etiologies, including biliary casts. Recognition of these rare entities is key to delineate the most appropriate management modality to expedite proper care.

03

Evaluating the effect of a low-calorie prehepatectomy diet on perioperative outcomes: a systematic review and meta-analysis. ***Zuhaib Mir, Henry Lam, Jennifer Flemming, Diederick Jalink, Sulaiman Nanji, Sean Bennett.*** **From Queen's University (Mir, Flemming, Jalink, Nanji, Bennett), and Sunnybrook Health Sciences Centre (Lam).**

Background: Few studies have evaluated the potential benefits of preoperative calorie-restricted diets among patients undergoing hepatectomy. This systematic review aimed to assess the effect of low-calorie prehepatectomy diets on perioperative outcomes. **Methods:** This study was conducted in accordance with the PRISMA and Meta-analysis of Observational Studies in Epidemiology guidelines. Following a comprehensive literature search, 2 reviewers independently screened references and backgrounded relevant study details. We included all comparative studies of patients undergoing hepatectomy, with some receiving a preoperative low-calorie diet of any type/duration. Pooled analyses of outcomes were performed where appropriate. **Results:** The search strategy yielded 210 citations, with 3 studies meeting inclusion criteria (1 randomized trial and 2 retrospective cohort studies; including 1 study of donor hepatectomies). In all, 243 patients were assessed, with 98 receiving a low-calorie prehepatectomy diet. Diet length was 1 week in 2 of the studies, and a median of

7.3 weeks in the third. Diet compliance was high. Patients receiving a prehepatectomy diet demonstrated significantly less steatosis, steatohepatitis, and intraoperative blood loss (mean difference –319.0 [–486.9 to –151.1] mL, $p < 0.001$), compared with controls. One study showed decreased perioperative blood transfusions for patients receiving the low-calorie diet, though not statistically significant. There were no differences in postoperative complications, length of stay, or mortality (no deaths reported). **Conclusion:** Low-calorie prehepatectomy diet is an understudied intervention for preoperative patient optimization. Current literature shows promise, as evidenced by decreased steatosis, intraoperative blood loss, and potentially decreased perioperative blood transfusions. Further study of such dietary initiatives is necessary to fully appreciate their role in improving perioperative and postoperative outcomes.

04

Toxicity profiles of systemic therapy for advanced hepatocellular carcinoma: a systematic review to guide neoadjuvant trials. ***Christopher Griffiths*, *Betty Zhang*, *Kasia Tywonek*, *Brandon Meyers*, *Pablo Serrano*. From McMaster University (Griffiths, Tywonek, Meyers, Serrano) and University of Ottawa (Zhang).**

Background: The recent development of targeted therapy and immunotherapy has made neoadjuvant therapy an attractive option for patients with hepatocellular carcinoma (HCC). However, surgeons are concerned that adverse effects of neoadjuvant therapy with these agents could lead to delayed or even cancelled surgeries. This review aimed to summarize the current evidence regarding toxicity profiles for tyrosine kinase inhibitors (TKIs) and immune checkpoint inhibitors (ICIs) in patients with HCC, to guide future neoadjuvant trials. **Methods:** Search of MEDLINE, Embase, and CENTRAL was performed. Articles published between 1990 and the time of search comparing TKIs and ICIs in patients with HCC were eligible for inclusion. A random-effects model was used. **Results:** Twenty-eight studies were included (n = 12 385, median age 62 yr [range 18–89], 84% ± 3% male, 82% ± 16% Barcelona Clinic Liver Cancer Stage C, and 97% ± 6% Childs A cirrhosis). In total, 21% of patients receiving TKIs had liver toxicity (95% confidence interval [CI] 16%–26%) compared with 28% of patients receiving ICIs (95% CI 21%–35%). Severe adverse events occurred in 46% (95% CI 40%–51%) of patients receiving TKIs compared with 24% (95% CI 13%–35%) of patients receiving ICIs. Compared with patients receiving sorafenib, other TKIs led to similar rates of liver toxicity (relative risk [RR] 1.06, 95% CI 0.92–1.24), but higher rates of severe adverse events (RR 1.24, 95% CI 1.07–1.44). Comparing ICIs to sorafenib, there were similar rates of liver toxicity (RR 1.10, 95% CI 0.86–1.40) and severe adverse events (RR 1.19, 95% CI 0.95–1.50). **Conclusion:** Serious adverse events were lower with ICIs compared with TKIs, while liver toxicity was similar. Combination therapy with novel ICIs is an appealing option in trials of neoadjuvant therapy for patients with HCC, as it is unlikely to delay or cancel surgery but requires evaluation in preoperative trials.

05

Should cell salvage be used in liver resection and transplantation? A systematic review and meta-analysis. ***Luckshi Rajendran*, *Tori Lenet*, *Risa Shorr*, *Jad Abou-Khalil*, *Kimberly Bertens*, *Fady Balaa*, *Guillaume Martel*. From University of Toronto (Rajendran), The Ottawa Hospital (Lenet, Shorr, Abou-Khalil, Bertens, Balaa, Martel), University of Ottawa (Lenet, Abou-Khalil, Bertens, Balaa, Martel), and The Ottawa Hospital Research Institute (Lenet, Martel).**

Background: Intraoperative red blood cell (RBC) transfusions are common in liver surgery and associated with increased morbidity. Intraoperative blood salvage and autotransfusion (IBSA) can be used to minimize allogeneic transfusion. A theoretical risk of cancer dissemination has limited IBSA adoption in oncologic surgery. The objective of our study was to systematically review existing literature to evaluate the effect of IBSA use on RBC transfusion and postoperative outcomes in liver surgery. **Methods:** Electronic databases were searched from inception until May 2021. Studies comparing IBSA in liver resection or transplantation for any indication were included. Screening, data extraction, and risk of bias assessment were conducted independently, in duplicate. The primary outcome was intraoperative allogeneic RBC transfusion. Secondary outcomes included overall survival (OS) and disease-free survival (DFS) for patients undergoing oncologic surgery. Data from transplant and resection studies were analyzed separately. Random-effects models were used for meta-analysis. **Results:** Twenty-one observational studies were included (16 transplant, 5 resection, n = 3433 patients). Seventeen studies incorporated oncologic indications. In liver transplant studies (n = 10), IBSA was associated with decreased allogeneic RBC transfusion overall, and in the malignancy-only subgroup. Too few liver resection studies reported on allogeneic RBC transfusion for meta-analysis. No significant difference existed in OS or DFS in liver transplant (OS: hazard ratio [HR] 1.12, 95% confidence interval [CI] 0.75–1.68, $p = 0.59$, $I^2 = 0\%$; DFS: HR 0.93, 95% CI 0.57–1.48, $p = 0.75$, $I^2 = 0\%$) and liver resection studies (OS: HR 0.69, 95% CI 0.45–1.05, $p = 0.08$, $I^2 = 0\%$; DFS: HR 0.93, 95% CI 0.59–1.45, $p = 0.74$, $I^2 = 0\%$). **Conclusion:** IBSA may reduce intraoperative allogeneic RBC transfusion without compromising oncologic outcomes. The evidence base supporting these findings is limited in size and quality, and high-quality randomized controlled trials are needed.

06

The association between surgeon and hospital variation in use of laparoscopic liver resection and short-term outcomes. ***Jesse Zuckerman*, *Shiva Jayaraman*, *Alice Wei*, *Alyson Mahar*, *Yosuf Kaliwal*, *Guillaume Martel*, *Natalie Coburn*, *Julie Hallet*. From University of Toronto (Zuckerman, Jayaraman, Coburn, Hallet), Memorial Sloan Kettering (Wei), University of Manitoba (Mahar), ICES (Kaliwal), and University of Ottawa (Martel).**

Background: Laparoscopic liver resection (LLR) offers equivalent oncologic outcomes to open resection while reducing complications and hospital stays in selected patients. However, LLR uptake may vary across providers and centres with differing expertise given the constraints of laparoscopy for liver resection. We examined how surgeon and hospital LLR uptake associates with short-term outcomes. **Methods:** We performed a population-based study including patients undergoing elective hepatectomy for gastrointestinal cancer in 2007–2019 at regionalized hepato-pancreato-biliary centres. For each surgeon and hospital, hierarchical regression estimated case-mix-adjusted rates of LLR, 90-day major morbidity/mortality, and prolonged length of stay. Linear regression estimated the association between rates of LLR and outcomes. **Results:** We included 5015 patients (median age 63 yr, 38.4% female, 61.7% major resections), 62 surgeons, and 11 hospitals. A total of 17.7% of patients had LLR. Adjusted LLR rates ranged from 2.7% to 100% for surgeons and from 6.9% to 56.6% for hospitals. We observed no association between LLR and 90-day morbidity/mortality rates across surgeons ($\beta = 0.03$, 95% confidence interval [CI] –0.03 to 0.09) and hospitals ($\beta = 0.06$, 95% CI –0.24 to 0.37). Similarly, there was no association between rates of LLR and prolonged stays (surgeon: $\beta = -0.02$, 95% CI –0.05 to 0.01; hospital: $\beta = -0.11$, 95% CI –0.29 to 0.08). **Conclusion:** Increased uptake of LLR for surgeons or hospitals was not associated with better short-term outcomes. While LLR associates with patient-level benefits in trial settings, this was not observed when considered from the provider and institution perspective using real-world data. While laparoscopy may contribute to better patient outcomes, further systematic processes of care should be identified to support ongoing incremental improvements.

07

Systematic review and meta-analysis of prognostic factors for early recurrence in intrahepatic cholangiocarcinoma after curative-intent resection. ***Woo Jin Choi, Phil Williams, Marco Claasen, Tommy Ivanics, Marina Englesakis, Steven Gallinger, Bettina Hansen, Gonzalo Sapisochin.*** **From the University of Toronto.**

Background: Recurrence rates of intrahepatic cholangiocarcinoma (iCCA) after curative hepatectomy are as high as 50%–70% and about half of these recurrences occur within 2 years. The objective of this systematic review was to define prognostic factors (PFs) for early recurrence (ER, within 24 months) and 24-month disease-free survival (DFS) after curative-intent iCCA resections. **Methods:** Systematic searching was conducted from database inception to Jan. 14, 2021. Duplicate independent review and data extraction were conducted. Data on 13 predefined PFs were collected. Meta-analysis was conducted on PFs for ER and summarized using forest plots. The Quality in Prognostic Factor Studies tool was used for risk of bias assessment. **Results:** Ten studies comprising 4158 patients were included, with accrual period from 1990 to 2016. In the risk of bias assessment, 6 studies were rated low risk and 4 were rated moderate risk. In total, 49.6% (95% confidence interval 49.2–50.0) of patients experienced ER after curative-intent iCCA resection. Nine studies were pooled for meta-analysis. Of the postoperative PFs, multiple tumours, microvascular invasion, macrovascular invasion, lymph node metastasis, and R1 resection were associated with an increased hazard for ER or reduced 24-month DFS, and the opposite was observed for receipt of adjuvant chemotherapy/radiation therapy. Of the preoperative factors, neither cirrhosis, sex, and hepatitis B virus status were associated with ER or 24-month DFS. **Conclusion:** The findings from this systematic review could allow for improved surveillance, prognostication, and treatment decision making for patients with resectable iCCAs. Further well-designed prospective studies are needed to explore prognostic factors for iCCA ER focusing on preoperative variables.

08

Impact of neoadjuvant chemotherapy on postoperative outcomes of patients undergoing hepatectomy for intrahepatic cholangiocarcinoma: ACS-NSQIP propensity-matched analysis. ***Woo Jin Choi, Tommy Ivanics, Marco Claasen, Steven Gallinger, Bettina Hansen, Gonzalo Sapisochin.*** **From the University of Toronto.**

Background: Neoadjuvant chemotherapy (NAC) use with intrahepatic cholangiocarcinoma (iCCA) is increasing. However, the immediate postoperative safety of NAC on patients undergoing hepatectomy for iCCA is not well established. The objective of this study was to compare the 30-day postoperative complications and length of stay (LOS) between patients undergoing hepatectomy for iCCA with and without NAC. **Methods:** A retrospective study was conducted using the American College of Surgeons National Surgical Quality Improvement Program database with targeted hepatectomy Participant Use Files queried from 2014 to 2018. Selected covariates were age, sex, body mass index, American Society of Anaesthesiologists score, ascites, congestive heart failure, cirrhosis, chronic obstructive pulmonary disease, current smoker, diabetes, dyspnea, hypertension, hepatitis, portal vein embolization, hepatectomy type, operative approach, pringle manoeuvre, biliary reconstruction, operation time, intraoperative ablation, drain placement, and pathological TNM stages. Patients with NAC receipt were propensity-score-matched into 1:3 ratio with controls using the greedy-matching algorithm and a caliper of 0.2. Logistic and Poisson regression models were used to estimate the effect sizes. **Results:** A total of 1508 patients who underwent hepatectomy for iCCA were included; 706 patients remained after matching and balance were achieved. The NAC group had 110 (60.1%) complications v. 289 (55.3%) complications in the non-NAC group ($p < 0.29$). Bleeding requiring transfusion was higher in the NAC group (43.2% v. 29.4%, $p < 0.001$). NAC was not associated with worse 30-day postoperative complications (odds ratio [OR] 1.24, 95% confidence interval [CI] 0.87–1.76, $p < 0.24$). Postoperative LOS in the NAC group was 8.56 ± 7.4 days v. 9.27 ± 8.41 days in the non-NAC group ($p < 0.32$). NAC was not associated with longer postoperative LOS (relative risk [RR] 0.93, 95% CI 0.80–1.08, $p = 0.32$). No significant trend in the NAC utilization was observed from 2014 to 2018 ($p = 0.34$). NAC can be safely administered preoperatively without increasing the risk of 30-day complications or postoperative hospital LOS. **Conclusion:** The results from this study could guide physicians' counselling of patients when offering NAC before iCCA resection.

09

The impact of prophylactic negative pressure wound therapy on surgical site infections in pancreatic resection: a systematic review and meta-analysis. ***Richard Gilbert*, *Tori Lenet*, *Jad Abou-Khalil*, *Fady Balaa*, *Guillaume Martel*, *Alexandre Brind'Amour*, *Kimberly Bertens*. From The Ottawa Hospital (Gilbert, Lenet, Abou-Khalil, Balaa, Martel, Bertens), and CHU de Québec-Université Laval (Brind'Amour).**

Background: Surgical site infections (SSIs) are a cause of significant morbidity in patients undergoing pancreatic resection. Prophylactic negative pressure wound therapy (NPWT) has been demonstrated to promote wound healing and potentially decrease SSIs. The objective of this review is to evaluate the effect of prophylactic NPWT on SSI in patients undergoing pancreatic resection. **Methods:** Electronic databases were searched from inception until June 2021. Randomized controlled trials (RCTs) comparing prophylactic NPWT to standard dressings in patients undergoing elective pancreatic resection were included. Screening, data extraction, and risk of bias assessment were conducted in duplicate independently. The primary outcome was the risk of SSI. Secondary outcomes included the risk of superficial and deep SSI and organ space infection (OSI). Random-effects models were used for meta-analysis. **Results:** Four single-centre RCTs including a total of 309 patients were identified. Three studies were industry sponsored, and 2 studies were deemed to have high risk of bias. There was no significant difference in the risk of SSI patients who received NPWT compared with those who received conventional dressings (14% v. 21%, relative risk 0.72, 95% confidence interval 0.32–1.60, $p = 0.42$, $I^2 = 53\%$). Likewise, there was no significant difference in the risk of superficial and deep SSI or OSI between treatment groups. No significant difference was found on subgroup analysis of patients at high risk of wound infection or on sensitivity analysis of studies at low risk of bias. **Conclusion:** Prophylactic NPWT did not appear to significantly decrease the risk of SSI among patients undergoing elective pancreatic resection. There is insufficient evidence to justify their routine use in this patient population, even in patients at high risk of wound infection.

10

Does hepatic pedicle clamping increase the risk of colonic anastomotic leak after combined hepatectomy and colectomy? Analysis of the ACS NSQIP database. ***Tori Lenet*, *Fady Balaa*, *Kimberly Bertens*, *Guillaume Martel*, *Jad Abou-Khalil*. From the University of Ottawa.**

Background: Hepatic pedicle clamping (HPC) is frequently used to minimize blood loss during liver parenchymal transection in patients undergoing hepatectomy; this may cause intestinal hypoperfusion and is considered a possible risk factor for colonic anastomotic leak. The objective of this study is to determine the effect of HPC on the risk of colonic anastomotic leak in patients undergoing combined hepatectomy and colectomy. **Methods:** Patients undergoing combined hepatectomy and colectomy between 2014 and 2018 were identified from the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database. Organ space infection was used as a surrogate marker for colonic anastomotic leak. We performed 1:1 coarsened exact matching for age, body mass index, American Society of Anesthesiology score, diabetes, smoking, wound class, type of colectomy, type of hepatectomy, and creation of a diverting stoma. Multivariable logistic regression of the unmatched patient cohort was also performed adjusting for the same covariates. **Results:** We identified 549 patients, of whom 130 (23%) underwent HPC during the study period. Ninety-one patients (17%) had organ space infections. Among 218 patients in the matched cohort, there was no difference in organ space infections among patients with or without HPC (17.4%, 95% confidence interval [CI] 10.2–24.6 v. 14.7%, 95% CI 7.9–21.4, $p = 0.58$). Similarly, there was no difference in the odds of organ space infection in patients with and without HPC on multivariable logistic regression (odds ratio 1.1, 95% CI 0.64–1.91, $p = 0.72$). HPC was not associated with organ space infection, which covaries with colonic anastomotic leak, in patients undergoing combined hepatectomy and colectomy. **Conclusion:** Prospective studies are needed to determine the safe duration and technique (i.e., intermittent or continuous) of HPC in this patient population.

11

Development of a culture process to grow a full-liver tissue substitute. ***Nawal Ambis*, *Yves Collin*. From Université de Sherbrooke.**

Background: Transplantation is the only definitive treatment for liver failure. Organ shortage significantly limits the number of patients that can benefit from newly transplanted liver. Promising techniques in cell therapy are emerging to find alternative options to treat liver disease. This work aims to develop a culture process to grow a full-liver tissue substitute using engineering approaches. **Methods:** In this project, isolation and culture of full liver biopsies have been performed either from mice or from patients undergoing liver resection. Two methods of cell isolation were developed and compared. The static cell isolation method uses human liver samples obtained from our main hospital biobank. After mechanical dissection and incubation under agitation in a proprietary enzymatic formulation following several steps, the resulting tissues are cultured in a growth medium. The second method is the dynamic cell isolation, using a perfusion digestion technique on rat liver tissue. The extracellular matrix is digested by perfusion of a digestive medium through the vena cava. The remaining tissue is prepared for culture as well. Both samples from each technique were processed for paraffin-embedding and analyzed under the microscope. **Results:** Three main differences were noted comparing the 2 techniques. The red blood cells were more present in static processed samples, in comparison to dynamic ones. The number of isolated cells using the dynamic methods was significantly much higher compared with the static method. Perfusion is more efficient, allowing sufficient collagenase penetration within the liver, which is one of the most vascularized organs. A lower cell density was observed in the static samples during culture compared with the dynamic processed cells. **Conclusion:** Primary hepatic cell culture is a useful technique

that can be widely used in basic liver function research as well as in cell therapies in hepatocellular carcinoma. Preliminary results indicate that the perfusion-based dynamic method is more efficient.

12

Liver transplantation for fibrolamellar hepatocellular carcinoma: an analysis of the European Liver Transplant Registry. ***Marco Claasen*, *Tommy Ivanics*, *Christian Toso*, *Rene Adam*, *Jan IJzermans*, *Gonzalo Sapisochin*, *Wojtek Polak*; *for the European Liver and Intestine Transplant Association*. From Erasmus MC Transplant Institute (Claasen, IJzermans, Polak), University Medical Centre Rotterdam (Claasen, IJzermans, Polak), University Health Network (Claasen, Ivanics, Sapisochin), Geneva University Hospitals and Faculty of Medicine (Toso), APHP Hôpital Universitaire Paul Brousse (Adam), and Université Paris-Saclay (Adam).**

Background: Liver transplantation (LT) for fibrolamellar hepatocellular carcinoma (FL-HCC) remains under debate. We sought to evaluate the oncological outcomes after LT for FL-HCC by analyzing data from the European Liver Transplant Registry (ELTR). **Methods:** All ELTR-registered cases of LT before July 2021 were considered, but only those for patients with a confirmed diagnosis of FL-HCC were included. Overall survival (OS) and recurrence-free survival (RFS) rates were estimated using the Kaplan–Meier method. For cumulative incidence of recurrence, death without recurrence was considered a competing event. **Results:** Thirty-five FL-HCC patients from 25 centres were included, all transplanted between 1985 and 2020. The median age was 30 years (interquartile range [IQR] 23–46). At listing, 46% of patients had already been diagnosed with FL-HCC, 43% were listed for HCC, and for 11% the listing reason was unknown. Only 3 patients (9%) had an underlying liver disease: 2 had alcoholic liver disease and 1 had nonalcoholic steatohepatitis. The median tumour number at listing was 1 (IQR 1–2), with a largest lesion size of 55 mm (IQR 20–140). Median pre-LT tumour marker levels were 6 (IQR 3–118) for α-fetoprotein, 14.8 (IQR 2.7–13.0) for carbohydrate antigen 19-9, and 1.25 (IQR 0.25–2.15) for carcinoembryonic antigen. At explant pathology, the median tumour number was 1 (IQR 1–2), with a median maximum lesion size of 60 mm (IQR 32–150). Vascular invasion was present in 37%. Recurrence occurred in 40% of the patients, most frequently extrahepatic (64%). Oncological outcomes at 1, 3 and 5 years were as follows: OS 86%, 67%, 64%; RFS 77%, 62%, 52%; cumulative incidence of recurrence 17%, 30%, 39%. Patients with a single tumour at explant pathology (median size 90 mm [IQR 40–150]) showed a 5-year OS of 76%, 5-year RFS of 57%, and 5-year cumulative incidence of recurrence of 43%. **Conclusion:** LT for FL-HCC yields acceptable long-term survival outcomes, especially for patients with a single lesion. However, recurrence rates remain high in all groups.

13

Arming beneficial viruses to treat pancreatic cancer. ***Sarah Mansouri*, *Maxime Léveillé*, *Christine Lawson*, *Yves Collin*, *Lee-Hwa Tai*. From Université de Sherbrooke.**

Background: Oncolytic virotherapy is a promising treatment option for immunologically cold tumours, such as pancreatic ductal adenocarcinoma (PDAC). Immunologically cold tumours are tumours with low rates of tumour infiltrating lymphocytes, allowing them to evade the immune system. Immune checkpoint inhibitors have failed to show clinical efficacy in this disease owing to the relative absence of immune cells in the PDAC tumour microenvironment. Vesicular stomatitis virus (VSV), an oncolytic virus with a long-established safety profile, specifically infects, replicates and lyses cancer cells, without harming healthy cells. Furthermore, infection with VSV stimulates the innate and adaptive immune system to mount a strong antitumour immune response toward cancer cells. This host antitumour immunity is aimed at both local and distant disease and is mediated by immune-activating proteins released upon immunogenic cell death (ICD) of the cancer cells induced by viral infection. We hypothesized that arming oncolytic VSV with an immune-stimulating transgene (TNFSF14, otherwise known as LIGHT) will generate a significant antitumour immune response in PDAC, leading to durable tumour regression. The first objective of this study was to characterize the fitness of the newly engineered VSV-LIGHT, including its capacity to infect, replicate, induce cell death and produce bioactive LIGHT in PDAC cell lines. The second objective was to assess the ability of VSV-LIGHT to induce immunogenic cell death following lysis of pancreatic cancer cell lines. The third objective will be to test the tumour targeting ability of VSV-LIGHT in vivo. **Methods:** The oncolytic virus VSV-LIGHT, engineered in our laboratory, was used in this study, and compared with its parental VSV strain. The murine PDAC cell lines Panc02 and MiaPaca1 were used for in vitro experiments. Multiple assays were performed to investigate the research hypothesis, including cytotoxicity, viral replication, and protein production (Western blot, flow cytometry). **Results:** Our results demonstrated that VSV-LIGHT retains its abilities to infect, replicate and lyse PDAC cell lines despite the insertion of the LIGHT transgene. In addition, we measured bioactive LIGHT following infection. Furthermore, we detected biomarkers of ICD including ATP and HMGB1 following infection with VSV-LIGHT. **Conclusion:** These results suggest that VSV-LIGHT is a functional virotherapeutic and possesses an immune activating capacity. Taken together, our findings suggest that VSV-LIGHT has translational potential as a viroimmunotherapy for PDAC. The next step is to test our oncolytic virus in the immune competent C57Bl/6-Panc02 mouse model already established in our laboratory.

14

Hepaticoduodenostomy versus hepaticojenunostomy for biliary reconstruction: a retrospective review of a single-centre experience. ***Adriana Workewych*, *Brittany Greene*, *Shiva Jayaraman*, *Melanie Tsang*. From University of Toronto.**

Background: Bile duct resection and reconstruction is commonly performed for restoration of biliary flow. The most common techniques used are hepaticoduodenostomy (HD) and Roux-en-Y hepaticojejunostomy (HJ). HJ has traditionally been favoured over HD owing to concerns of a higher risk of

cholangitis and biliary gastritis with HD. Studies suggest, however, that the 2 techniques are comparable in complication rates and surgical outcomes, for instance when managing choledochal cysts. Importantly, HD may confer several advantages, including shorter operative times and hospital stay. Significantly, HD allows for postoperative endoscopic access, for instance if biliary stones or strictures form, because the reconstruction more closely resembles bilioenteric anatomy. **Methods:** We therefore performed a retrospective cohort study comparing outcomes and complication rates between HD and HJ for biliary reconstruction at St. Joseph's Health Centre. All patients who underwent HD or HJ between 2010 and 2021 were retrospectively identified as study participants. Inclusion criteria were patient age > 18 years, and a minimum of 1 month clinical/postsurgical follow-up. **Results:** Fifty-two patients, 16 of whom underwent HD and 32 of whom underwent HJ, met eligibility criteria and were included. We found no statistically significant differences in operative time (HD 4:22 h; HJ 5:00 h, $p = 0.121$), intraoperative or early postoperative complication rates (HD 1; HJ 2, $p = 0.920$), duration of hospital stay (HD 7 d; HJ 9.5 d, $p = 0.127$), or long-term complication rates (HD 1; HJ 4, $p = 0.580$) between the 2 groups. **Conclusion:** These results will contribute to the literature around this topic and aide in surgical planning around reconstruction of the biliary tree. Therefore, in a surgical field where endoscopic co-management has become essential, the potential benefits of HD cannot be overlooked.

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Feasibility and safety of a "shared care" model in complex hepatopancreatobiliary surgery: a 5-year analysis of pancreaticoduodenectomy. ***Alex Lee*, *Ahmed Al-Arnawoot*, *Luckshi Rajendran*, *Tyler Lamb*, *Anastasia Turner*, *Morgann Reid*, *Janelle Rekman*, *Richard Mimeault*, *Jad Abou-Khalil*, *Kimberly Bertens*, *Guillaume Martel*, *Fady Balaa*. From University of Ottawa (Lee, Al-Arnawoot, Lamb, Turner, Reid, Rekman, Abou-Khalil, Bertens, Martel, Balaa), University of Toronto (Rajendran), and Canadian Medical Protective Association (Mimeault).**

Background: Shared care models of practice, in which a group of interchangeable surgeons deliver clinical service, can improve system efficiency and foster peer support. However, concerns around maintaining a safe and acceptable standard in clinical outcomes remain. This study aims to elucidate the feasibility and safety of a shared care model in complex hepatopancreatobiliary (HPB) surgery. **Methods:** Patients who underwent elective pancreaticoduodenectomy between 2016 and 2020 were included. Shared care measures representing the interchangeability of surgeons were analyzed. These included the median number of HPB surgeons during a patient's care cycle, proportion of patients with different consenting v. primary operating surgeon (POS), proportion of patients who first encountered the POS at time of surgery, and cases involving co-surgery (> 1 attending surgeon during operation). A care cycle was defined as the period from 1 year before to 1 year after pancreaticoduodenectomy. The primary outcome, 30-day mortality, and secondary outcomes including unplanned return to the operating room (OR), sepsis, and surgical site infections (SSIs) were collected from the institution's National Surgical Quality Improvement Program (NSQIP) database and compared with the population rates of the NSQIP Collaborative. **Results:** A total of 174 patients were included. A median of 3 surgeons were involved throughout the patients' care cycle, 120 (69.0%) patients had different consenting surgeons v. POS, and 100 (57.5%) patients first met their POS at time of surgery. Co-surgery occurred for 137 (78.7%) patients. Death within 30 days occurred in 2 (1.1%) patients, unplanned return to the OR in 13 (7.5%), sepsis in 9 (5.2%), and SSI in 66 (17.2%). All corresponding population rates from the NSQIP Collaborative were within the 95% confidence intervals of the study group's rates except for sepsis. **Conclusion:** Shared care is feasible in complex HPB surgery without compromising patient outcomes and safety. Wider adoption may be encouraged to further address bottlenecks in a patient's care cycle and promote collaboration between surgeons.

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Laparoscopic v. open pancreaticoduodenectomy: initial institutional experience and NSQIP-matched analysis. ***Evelyn Waugh*, *Chris Zhang*, *Madeline Lemke*, *Juan Glinka*, *Ken Leslie*, *Anton Skaro*, *Ephraim Tang*. From Western University.**

Background: Laparoscopic pancreaticoduodenectomy (PD) is an emerging surgical technique in Canada. Perioperative outcomes associated with initial Canadian institutional experience with this technique have not been described. This study describes our institutional experience and compares perioperative outcomes of laparoscopic PD to National Surgical Quality Improvement Program (NSQIP)-reported open PD cases using a propensity-score-matched (PSM) analysis. **Methods:** Institutional data were collected prospectively from sequential laparoscopic PD patients between 2019 and 2022. PSM was performed using the subset of patients undergoing open PD identified in the 2020 NSQIP procedure targeted Participant Use Data File (PUF) for pancreatectomy, which was merged with the 2020 main NSQIP PUF to include perioperative outcomes. Institutional and NSQIP data were matched on age, sex, body mass index, comorbidities, pathology, pancreatic duct diameter and gland texture. **Results:** Sixty laparoscopic PD were performed at our institution from 2019 to 2020; 33% ($n = 20$) were converted to open. On PSM analysis, there was no significant difference between laparoscopic and open PD for length of stay (11.4 d v. 8.5 d, 95% confidence interval [CI] –0.49 to –6.38, $p = 0.09$), postoperative pancreatic fistula (39.6% v. 22.6%, 95% CI –0.94 to 34.8, $p = 0.063$), delayed gastric emptying (9.4% v. 15.1, 95% CI –18.9 to 7.6, $p = 0.4$), superficial surgical site infections (SSIs) (11.3% v. 5.6%, 95% CI –5.3 to 16.6, $p = 0.31$), deep SSIs (18.7% v. 15.1%, 95% CI –10 to 17.6, $p = 0.59$), 30-day readmission (24.5% v. 18.9%, 95% CI –9.5 to 20.8, $p = 0.47$), or 30-day mortality (3.8% v. 3.8%). Laparoscopic PD was associated with higher 30-day reoperation rate (13.2% v. 1.9%, 95% CI 1.3 to 21.3, $p = 0.03$). **Conclusion:** Laparoscopic PD remains in the early stage of the learning curve. Despite equivalence to open PD in the majority of outcomes, improvement must be made in reoperation rates. Ongoing analysis is needed to elucidate whether outcomes become superior as the technique refines over time.

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Laparoscopic spleen-preserving distal pancreatectomy: Why not do a Warshaw? ***Alice Zhu, Brittany Greene, Melanie Tsang, Shiva Jayaraman*. From University of Toronto.**

Background: Laparoscopic spleen-preserving distal pancreatectomy (LSPDP) can be accomplished with either resection of the splenic vessels via the Warshaw Technique (WT) or via preservation of the splenic vessels (VSPs). Our study aimed to compare outcomes for the 2 methods of LSPDP. **Methods:** We performed a retrospective chart review with intent-to-treat analysis of adults undergoing LSPDP at a single institution from 2009 to 2021. Outcomes of interests included the safety and clinical outcomes of the 2 approaches. We compared demographic characteristics, operative parameters, oncologic pathology review, and postoperative patient outcomes. **Results:** There were 102 consecutive cases of LSPDP (59 WT, 43 VSP) over 12 years. The rate of successful spleen preservation was not significantly different between the 2 groups (WT 76.3%, VSP 65.1%, $p = 0.27$). Rates of conversion to laparotomy; postoperative complications, including pancreatic fistulas and splenic infarcts; and amount of intraoperative blood loss were similar between the groups. Median operative time was significantly shorter with the WT (141 v. 177 min, $p < 0.05$). The median length of stay in hospital was not significantly different between the groups. **Conclusion:** Both techniques are safe and effective in preserving the spleen in LSPDP. The WT may be more efficient with respect to use of limited operating room resources, as it was more than 30 minutes faster than vessel preservation.

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The impact of COVID-19 on pancreaticoduodenectomy outcomes in a high-volume hepatopancreatobiliary centre. ***Helia Nabavian, Lev Bubis, Shiva Jayaraman, Melanie E. Tsang*. From University of Toronto.**

Background: During the COVID-19 pandemic, access to planned surgical care was restricted. It remains unknown whether this had any impact on outcomes for surgical oncology patients. We hypothesized that the pandemic resulted in diagnostic and therapeutic delays, leading to stage migration among patients with malignancies treated with a Whipple procedure. **Methods:** We performed a retrospective review of adult patients with a gastrointestinal malignancy who underwent surgical exploration for a planned pancreaticoduodenectomy (PD) at St. Joseph's Health Centre between Mar. 11, 2019, and Mar. 11, 2021. Primary outcomes included pathological findings and rates of nontherapeutic laparotomies between the 2 years. Secondary outcomes included wait-times for an operation and perioperative outcomes. **Results:** Comparing the 2 cohorts, the COVID-19 group ($n = 53$) had median wait-times of 27.75–42.25 days, which was statistically longer than the pre-COVID-19 cohort ($n = 87$) of 14.5–37 days ($p < 0.001$). With respect to baseline characteristics, types of pathologies, rate of unresectable disease and perioperative outcomes, the 2 cohorts had similar results. For patients with pancreatic ductal adenocarcinoma, 31% in the COVID-19 cohort were found to have metastatic disease compared with 14% in the pre-COVID-19 cohort, although not statistically significant ($p < 0.16$). The absolute volume of Whipple procedures was 39% less in the year of the pandemic, and the COVID-19 cohort experienced statistically significant longer wait times for imaging and surgery, confirming therapeutic and diagnostic delays during the pandemic. Despite this, there were no significant differences in primary and secondary outcomes between the cohorts. There was a trend toward a higher rate of metastatic disease in the COVID-19 cohort; however, the small sample sizes limited statistical power. **Conclusion:** While the short-term outcomes of those planned for PD were statistically similar between the 2 cohorts, longer term outcomes may differ due to changes in treatment practices during the pandemic.

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Transitioning from open to minimally invasive pancreaticoduodenectomy: the learning curve factor in an academic centre. ***Jorge Roldan, Olivia Ganescu, Tsafrir Vanounou, Jean-Sébastien Pelletier*. From McGill University.**

Background: Pancreatic surgery has been known to have substantial morbidity and mortality rates. Minimally invasive surgery has been shown to decrease morbidity and recovery time, which in the context of cancer, will eventually translate into a larger number of patients who will recover faster and be ready to get adjuvant systemic treatment. **Methods:** We compared 3 periods of time when we transitioned from a hybrid laparoscopic, a laparoscopic/robotic, and finally a fully robotic-assisted pancreaticoduodenectomy approach. We compared open to minimally invasive approaches in patients undergoing pancreaticoduodenectomy at our institution from September 2009 to December 2021, regardless of the diagnosis. Demographic, operative, and oncologic data were collected to compare outcomes. **Results:** A total of 161 patients were included in our analysis: 45 open, 116 minimally invasive (either hybrid laparoscopic, laparoscopic/robotic or fully robotic) There were no differences in patient demographics, comorbidities, or surgical indications. The minimally invasive group (hybrid/laparoscopic/robotic) had lower intraoperative blood loss, comparable length of hospital stay and a comparable percentage of complications than the open group. Continuous improvement in operative times was observed over the course of the experience as well as fewer conversion rates, which reached their lowest level in the fully robotic era (15%). There were no differences in pancreatic fistula rate. **Conclusion:** Regarding systemic chemotherapy, more patients undergoing minimally invasive resection get adjuvant treatment than patients undergoing open resection. In selected patients, minimally invasive pancreaticoduodenectomy is a safe and effective procedure with comparable outcomes to conventional open surgery.

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Closed-incision negative-pressure wound therapy following pancreaticoduodenectomy for prevention of surgical site infections in high-risk patients. ***Andrew Lagrotteria, Brittany Greene, Melanie Tsang, Shiva Jayaraman*. From University of Toronto.**

Background: Surgical site infection (SSI) remains one of the most common causes of morbidity after pancreaticoduodenectomy. SSI is associated with fascial dehiscence, readmissions, prolonged length of stay, delayed adjuvant chemotherapy initiation, and negative effects on quality of life. Negative pressure wound therapy devices, also known as incisional vacuum-associated closure devices (iVACs), applied to closed incisions may reduce SSI rates; however, evidence is limited. **Methods:** This was a single-institution, retrospective cohort study of patients who underwent pancreaticoduodenectomy with risk factors for SSI between June 2018 and May 2021. Risk factors for SSI included preoperative biliary drainage (endoscopic or percutaneous), neoadjuvant chemotherapy administered, diabetes, extreme obesity (body mass index > 40 kg/m^2), smoking history, or immunosuppression. SSI occurrence and readmissions within 30 postoperative days were recorded. Analysis using binary logistic regression for factors associated with SSI was performed for patients with and without iVAC devices, with $p < 0.05$ determined to be significant. **Results:** There were 175 patients included (61 iVAC, 114 standard closure). Significantly more patients underwent preoperative biliary drainage in the intervention group ($p = 0.006$). SSI occurred in 13% of patients with an iVAC and in 16% of patients with standard closure ($p = 0.635$). Of patients who underwent preoperative biliary drainage, SSI occurred in 10% of patients with an iVAC and 20% of patients with standard dressings ($p = 0.196$). Binary logistic regression using SSI as the end point demonstrated nonsignificant associations with iVAC use when adjusting for high-risk characteristics. Binary logistic regression using readmissions as the end point demonstrated significant association with SSI but nonsignificant associations with iVAC use and other covariates (odds ratio 3.82, 95% confidence interval 1.39–10.89, $p = 0.01$). Negative pressure wound therapy use was associated with a nonsignificant reduction in the occurrence of SSI compared with standard care. **Conclusion:** iVAC use may not be indicated for high-risk patients without preoperative biliary drainage. Further investigation will help resolve the existing equipoise.

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Robotic Appleby procedure for recurrent pancreatic cancer. ***Jorge Roldan, Olivia Ganescu, Jean-Sébastien Pelletier, Tsafrir Vanounou.*** **From McGill University.**

Background: A 49-year-old male being followed for a small pulmonary lung nodule underwent computed tomography (CT) in September 2018 and was found to have pancreatic duct dilatation and atrophy of the pancreatic tail. A subsequent endoscopic ultrasound (EUS) and biopsy confirmed adenocarcinoma. The patient was included in our neoadjuvant trial. He was started on systemic treatment in February 2019 and tolerated it well. **Methods:** The group agreed to proceed with surgery. The patient underwent a distal pancreatectomy and splenectomy in June 2019. **Results:** He had a good treatment response, with a 50% response. None of the 12 lymph nodes had the disease: T2 N0. He was restarted on systemic therapy. He finished chemotherapy (FOLFIRINOX) in November 2019. He remained stable for almost 2 years. A CT scan performed in September 2021 showed a small soft tissue mass measuring 2.8 × 2.1 cm around the distal celiac trunk, and common hepatic artery A positron emission tomography scan performed on Dec. 8, 2021, showed a 3 cm soft-tissue mass around the celiac trunk. An EUS was performed, and the biopsy was positive for adenocarcinoma. **Conclusion:** The patient received chemotherapy and an angiography, which revealed a good flow through the liver via the gastroduodenal artery. The patient underwent a modified robotic Appleby procedure.

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The influence of viral hepatitis status on posthepatectomy complications in patients with hepatocellular carcinoma: a NSQIP analysis. ***Luckshi Rajendran, Woo Jin Choi, Hala Muaddi, Tommy Ivanics, Marco P.A.W. Classen, Gonzalo Sapisochin.*** **From University of Toronto (Rajendran, Choi, Muaddi) and University Health Network (Ivanics, Classen, Sapisochin).**

Background: Hepatitis B virus (HBV) and hepatitis C virus (HCV) are common etiologies of hepatocellular carcinoma (HCC), but the role of viral hepatitis status in posthepatectomy outcomes has yet to be delineated. This study aimed to evaluate the effect of viral hepatitis status on 30-day posthepatectomy complications in HCC patients. Patients from the National Surgical Quality Improvement Program (NSQIP) database with known viral hepatitis status who underwent hepatectomy for HCC between 2014 and 2018 were included. **Methods:** Patients were classified according to viral hepatitis status: HBV-only, HCV-only, HBV and HCV co-infection (HBV/HCV), or no viral hepatitis (NV), which included other etiologies of liver disease (i.e., alcoholic, cryptogenic, nonalcoholic steatohepatitis). Multivariable logistic regression models were used to assess outcomes of interest. The primary outcome was occurrence of any 30-day posthepatectomy complication. The secondary outcomes were rate of major complications (Clavien–Dindo classification III-V) and posthepatectomy liver failure (PHLF), as defined by the International Study Group of Liver Surgery (ISGLS). A sensitivity analysis was performed for patients with and without liver cirrhosis. **Results:** We included 3234 patients who underwent hepatectomy for HCC. The 30-day complication rate was 207 of 663 (31.2%) with HBV, 356 of 1077 (33.1%) with HCV, 29 of 81 (35.8%) with HBV/HCV, and 534 of 1413 (37.8%) with NV ($p = 0.010$). In the adjusted analysis, viral hepatitis status was not associated with development of any 30-day posthepatectomy complication (HBV: odds ratio [OR] 0.88, 95% confidence interval [CI] 0.70–1.11; HCV: OR 0.90, 95% CI 0.74–1.09; HBV/HCV: OR 1.17, 95% CI 0.70–1.92) compared with patients without viral hepatitis. Similar results were found for secondary outcomes, major complications and PHLF. **Conclusion:** In both cirrhotic and noncirrhotic patients, no significant association was found between viral hepatitis status and 30-day posthepatectomy complications. In patients with HCC managed with surgical resection, viral hepatitis status is not associated with 30-day posthepatectomy complications, major complications and PHLF relative to patients without viral hepatitis, regardless of liver cirrhosis status.